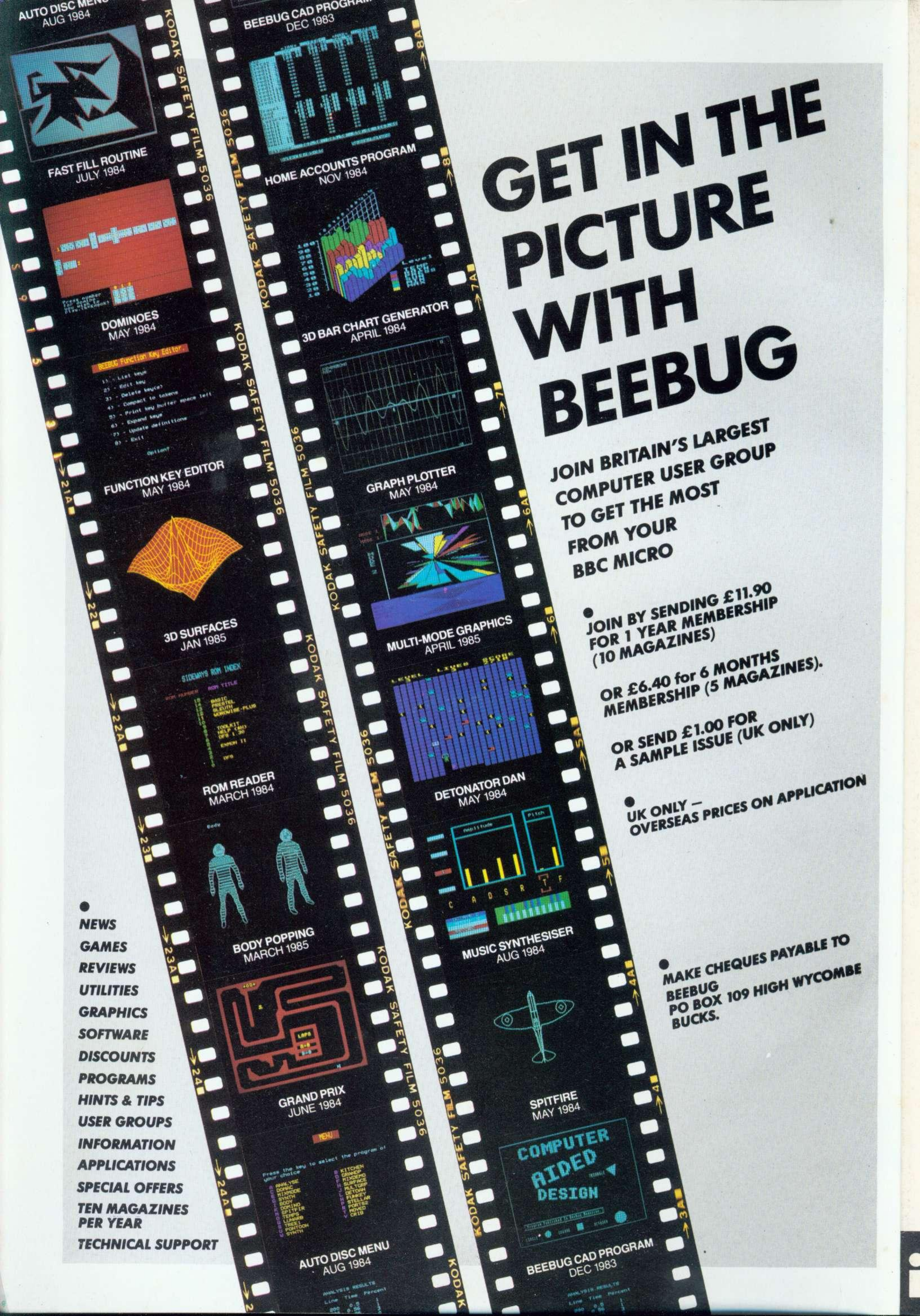
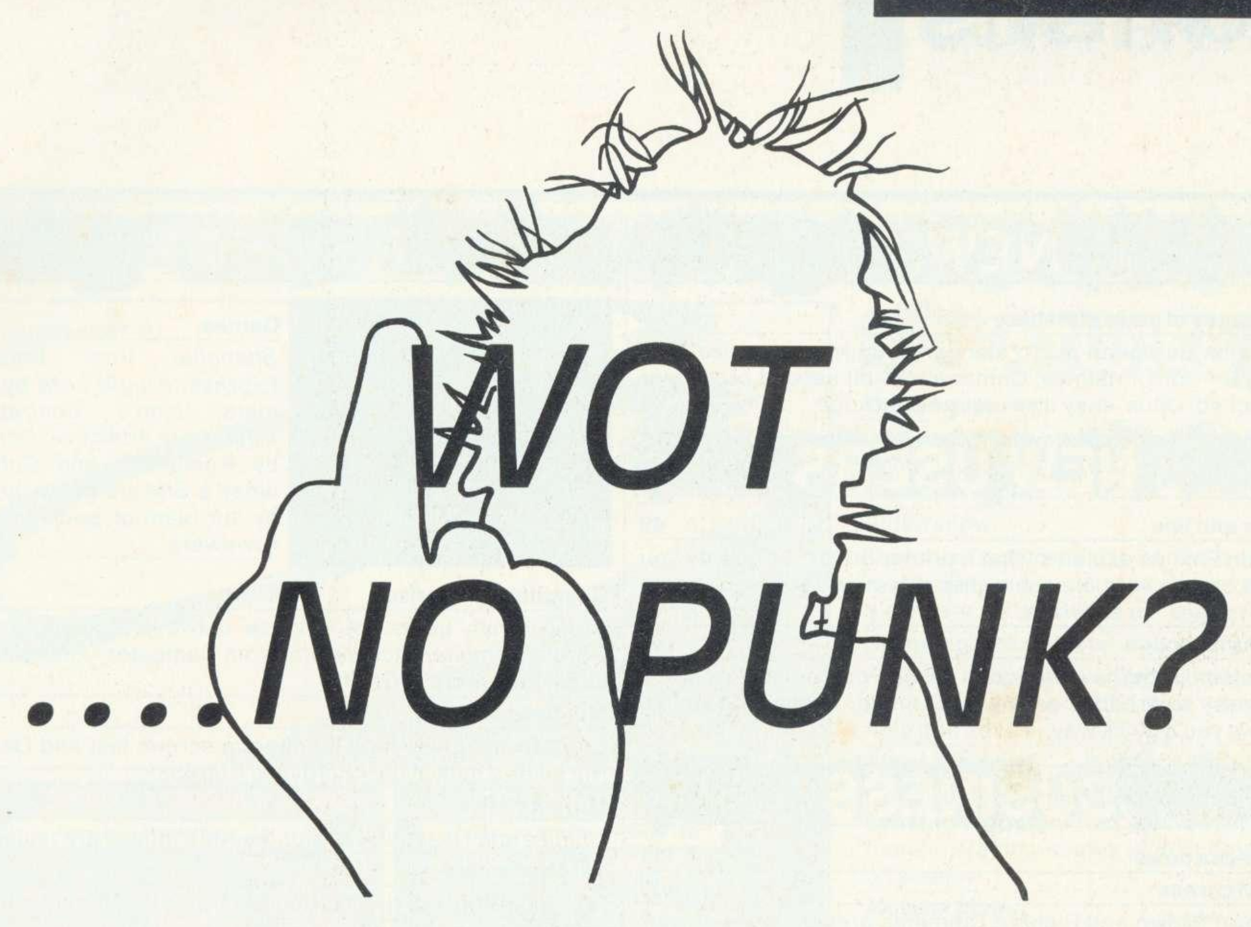

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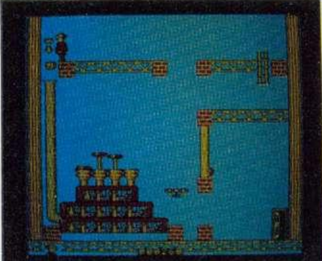
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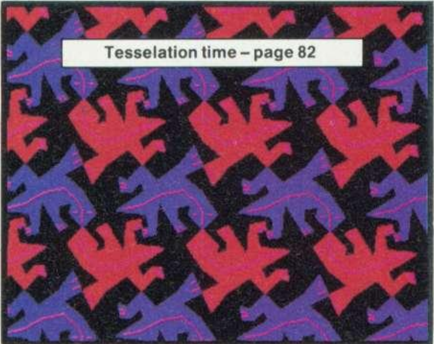
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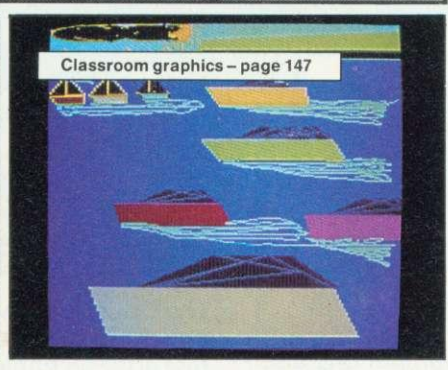
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Cover illustration by Peter Bentley

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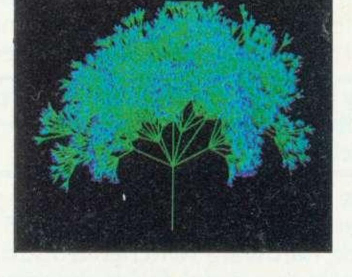
Christmas fun

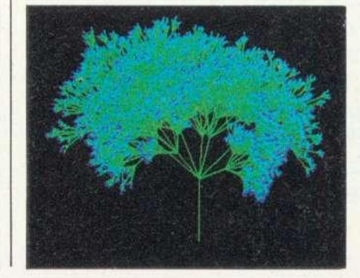
Shuggy's Garden will keep you occupied over the holiday – key it in and off you go!

Plotting a path

Joe Telford weaves his way through a field of plotters

Sideways RAM boards reviewed by Chris Drage





How to set up a business system

Data compression techniques revealed

Recursion

Graphics supremos Jim McGregor and Alan Watt turn their hands to the topic

DIY font generator

PUBLISHER'S STATEMENT

Acorn User's circulation figure for the January to June 1985 period has just been certified by the Audit Bureau of Circulation. The monthly circulation has risen to 62,365. The sharp 12 per cent increase indicates that more users are turning to *Acorn User* every month.

Notes for authors

Acorn User welcomes submissions from readers. Articles should be typed, double-spaced text with diagrams and screen dumps on separate sheets, or on disc in *Wordwise* (saved as a *SPOOL file using option 8) or *View* format. Leave large margins to allow space for editing.

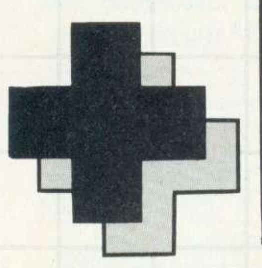
Please enclose all programs on disc or cassette, with listings if possible. Also follow the style used in presenting listings in the yellow pages section. Photos should be 35mm, or larger, transparencies, or 5in by 7in black and white prints. Ensure your name is on everything, and keep a copy. Enclose a suitable stamped, addressed envelope if the submission is to be returned. Attach a short letter with the article giving its title with a daytime phone number if possible. Address your article to the Technical editor. Articles are acknowledged on receipt, but not submissions for the regular columns, letters pages and competitions. Please limit telephone enquiries to the Technical editor to Wednesday and Thursday afternoons.

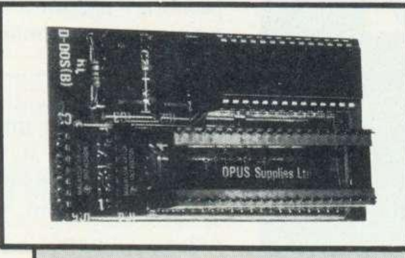


ABC









Here's a great opportunity to own Britain's number one disc upgrade for the BBC micro, a 'Megabyte Marvel' combining double density interface and powerful 5¼″ disc drive for only £199.95.

In the latest major test of five leading disc interface systems for the BBC computer, the Opus DDOS won the honours yet again. A & B Computing magazine placed it ahead of all the rival interface offerings. As the reviewer explained:

"My personal choice is still the Opus DDOS, basically for its flexible catalogue system and the additional commands which go with it."

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News in brief

■ TERRORMOLINOS is one of the better-hyped games releases: it's from **Melbourne House** and runs on the BBC and Electron. 'Saucivision' is one of the innovations in this graphics adventure from the authors of *Hampstead*. If you want an 'outrageous summer holiday spoof' it costs £7.95.

■ ONE game which needs no hype is the **BBC's White Knight 12**. It is claimed to be four times stronger than the mark II version which cleared the floor with the opposition's chess programs in *Acorn User*'s tests. It costs £18.95, on disc only. If you order by post it costs an outrageous £1.30 extra for p&p.

■ MEANWHILE the BBC's Dr Who is set to appear in a **Micropower** graphical adventure on October 19. **Dr Who and the Mines of Terror** is the follow-up to the bestselling *Castle Quest* (which sold 16,000 copies on the BBC). The map of the game is so big – the screens alone take up 18k – that the cassette version comes with an EPROM chip at £19.95 for the BBC micro only. A disc version is on the way.

■ FRONTIERS OF CHAOS is an exhibition focusing on the representation of the latest mathematical research through **computer graphics.**

A book about the displays is well worth the £4 cover price and is full of astounding colour illustrations.

The exhibition runs until October 13 at the London Science Museum, and then at the Large Examination Hall in Downing St, Cambridge, from October 22 to November 1. Other venues will include the universities of Leeds, Sheffield and Warwick. It is organised by the Goethe Institute (Tel: 01-581 3344).

Multi-language business package from Peartree

THE BBC micro has been repackaged for business users in an IBM-style case with built-in disc drives and a choice of operating system in six languages.

Peartree Systems has taken the 128k version of the B+ and added twin disc drives with a separate keyboard controlled by an infra-red link or cable and calls the machine the KBL128PC. It includes monochrome monitor and integrated business software and retails at £1150 (10Mb hard disc is £875 extra).

The operating system and user guides have been translated by Peartree into Arabic, French, German, Greek and Spanish. Keyboards have been altered to cope with each language, and have been used already by Acorn.

Acorn had an order for 210 standard Beebs with the French adaptations for Belgian schools.

Peartree Systems, Peartree Meadow, Ellington, Thorpe, Huntingdon, Cambs PE18 0AW.

Big three go for European micro

ACORN has joined forces with the two biggest names in European computing to produce a standard for educational computing – and each company could build a micro based on the outcome.

A technical group is being set up in France between Acorn, Olivetti and the major French electronics group, Thompson, to define the specification for a new educational computer. It will then be up to each company to manufacture a computer to fit into the new standard, in the same way that the Japanese have developed MSX.

Machines based on the standard would run the same software and have identical interfaces for peripherals.

Bob Coates, Marketing Manager of Acorn's Educational Division, estimated that any new micro developed wouldn't be available for about three years. Whether the BBC micro will play a part is uncertain, as all the companies are going into the talks with open minds. 'The standard will be the interface, not the hardware. We aim to do for education what IBM has done for business,' Coates said.

Although education is the main objective all the companies expect a home computer to be a spin-off. Coates continued 'It's a realistic goal if we don't try to begin with what we've got. If we start with principles not packages, then we've got a chance.

'We want innovation. The job is to create a new standard, and then it's Acorn's task to meet that. However we've managed to maintain compatibility so far.'

Each company is seen as having its own strengths. Olivetti's is design, Thompson's is industrial muscle, while Acorn's is education.

Common thinking between the companies has led to this agreement, Coates added. 'We looked around Europe for the market leaders, and came up with these names. They have had the same ideas.'

Enter the 128k Beeb

FOLLOWING in the wake of the 64k BBC B+, Acorn has announced the 128k BBC B+, a micro with double the memory capacity.

The new computer should be in the shops for Christmas selling at £499, and existing BBC B+ owners will be able to have their machines upgraded by Acorn approved dealers.

The extra 64k of memory is provided as four 16k sideways RAM banks that can be used to run languages and utilities loaded in from disc. However this memory may also be used as one continuous block to store long Basic programs, thanks to an upgraded version of Basic 2, BAS128.

When the micro is switched on it is configured as a standard 64k BBC B+, with four banks of sideways RAM. To transform this memory into a full 64k of memory for use by long Basic programs it is only necessary to load the BAS128, which is supplied on disc.

Although it's standard Basic 2, BAS128 is 19k in length, the extra 3k being new routines to handle the extra memory. Due to its increased size BAS128 does not occupy any sideways ROM/RAM memory but loads into the screen memory.

The 128k B+ is fully compatible with all existing hardware and software. However packages such as the *View* family cannot take advantage of the increased memory.

Acorn has also released an affordable disc upgrade for cassette-based BBC micros. The 1770 disc interface, supplied as standard on the BBC B+, is now available to model B owners for just £49.95.

The interface plugs into the big 8271 controller chip socket and is supplied with the 2.1 DFS. To take advantage of the double density capabilities of the 1770 floppy disc controller chip, the Advanced Disc Filing System (ADFS) is also available in ROM for an extra £29.99. Disc capacity is increased to 1.28Mbytes from 800k (though still limited to 31 files per side of disc).

Speed up the net

ECONET access times can be speeded up by using a *BGET command implemented in a utilities package from Digital Services. It costs £75 plus VAT.

Dumps **is a package that costs £49 plus VAT which allows screens to be sent across the net to any station with a printer.**

Digital Services is at 159 Havant Road, Drayton, Portsmouth PO6 2AA.

The Young Ones

THE British Computer Society has launched a special division for users aged under 18 with a subscription of £5 a year. The group, called AYCE (Association of Young Computer Enthusiasts), will distribute a monthly magazine with competitions and discounts. Also a certification scheme will be produced with access to local computing professionals. Details from AYCE at PO Box 1BE, London W1A 1BE.

Big Ben strikes again in Holland

THE Big Ben Club is holding its third annual National Day on 19 October. The club – Holland's society for BBC micro and Electron users – has around 3000 members and is interested in the use of the BBC computer in education.

The show is at De Vechstreek Technical School in Breukelen, near Utrecht, from 10am to 5pm. A large number of dealers will be exhibiting and offering special deals on hardware and software.

Admission is Fl.5 for nonmembers, Fl.2,50 for under-12s. Full details from Harry A. Linsen, 219 M. Lutherweg, 1185 Al Amstelveen, Netherlands. Tel: 3120 416094.

Memory board mimics the B+



Le Modem from Watford

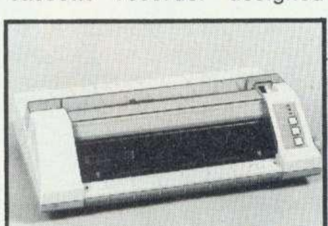
RAMAMP Computers has released a 64k RAM board for the BBC micro which mimics the B+. The RA20+44 has 20k of memory to replace the standard screen memory, plus two slots for sideways RAM.

The remaining 12k of RAM can be used for machine code programs or as an extended printer buffer, as on the BBC B+. No soldering is required. The price is £70 from Ramamp on (0533) 864966.

Communication is the theme of the latest release from ever-expanding Watford Electronics. Le Modem allows you to access bulletin boards throughout the globe. Auto dialling and auto answering are just two features. Supplied with a 16k ROM, for the price of £105.80 inclusive.

One of the older names in computing, Crofton Electronics, has reintroduced its popular 9in monochrome monitor for the BBC and Electron. The PM-101 is a metal-cased monitor with green or black and white screens at a cost of £82.80 inclusive. Details from 01-891 1923.

The Philips D6450 is a new cassette recorder designed specifically for use with computers. It includes a phase switch to give compatibility with cassette tapes made on different brands of recorders. Other features include displays to confirm program saving and loading and a mutable speaker. Price: £38. Information: 01-499 0414.



The Riteman F+ gives 105 cps

The Riteman F+ dot matrix printer from C Itoh Electronics is compatible with the Epson FX. It offers 105 characters per second printing with proportional spacing; near letter quality print; a full 96 ASCII italic character in addition to the normal compressed, emphasised and super/subscript character sets.

It has 2k of memory built-in as a buffer and an 8k memory option is available. For more about the Riteman F+, C Itoh can be contacted on 01-946 4906.

The Voltmace ASC is a joystick interface that plugs into the analogue port of the BBC micro. The interface is dual purpose so it can make analogue joysticks perform like switched ones and vice versa just by the flick of a switch. The Voltmace ASC costs £9.95 from dealers.

Cumana launch 16-bit processor

CUMANA has released a 16-bit second processor for the BBC micro. It uses Motorola's 68008 chip, already used in Sinclair's QL and the new Atari ST machines.

Unlike other second processor boards which plug into the Tube, the Cumana board sits inside the Beeb's case and plugs into the 6502 processor socket, with the chip relocating on to the 68008 board.

The board is supplied with half a megabyte of memory, which is not expandable at present. A double density floppy disc controller is also supplied, based on the 2797 controller chip. The operating system is the versatile OS-9 is supplied on disc and offers a degree of Unix compatibility.

Languages supplied include Pascal, C and Basic 09, and there's a range of applications software aimed at the business and scientific market. *Stylograph* is a word-processor with spellcheck and mailmerge capabilities; *Dynacalc* is a spreadsheet and *Sculptor* a database package.

The board is supplied with a single sideways ROM and costs £695 plus VAT. Further details from Cumana on (0483) 503121.

Listen in to satellites

ASTRID is hardware add-on for the Beeb which allows you to eavesdrop—perfectly legally—on messages from space satellites.

It costs £149 and is designed to receive and decode data transmitted to earth by the Uosat 1 and 2 satellites. This data comprises a wealth of information including satellite status reports, telemetric data (radiation levels, sun position, satellite power, etc), orbit information and TV camera pictures. The unit uses a standard tape recorder to save the data and comes with its own aerial.

Further details from MM Microwave Ltd, Thornton Rd Industrial Estate, Pickering, North Yorkshire YO18 7JB.

ROMs for the Electron Plus 1

ADVANCED Computer Products has launched a range of plug-in cartridges for the Electron Plus 1.

The Advanced ROM Adaptor (ARA) costs £10.35 and allows chip software not normally available for the Electron to be plugged in. ARA 2, at £14.92, can hold two sideways ROMs with the option to upgrade to sideways RAM at a future date.

The Advanced Sideways RAM (ASR) provides 16k of sideways RAM and it offers automatic write protection and comes with a cassette of utility programs for £39.10.

Two ROM-based products suitable for use with ARA are the Advanced Electron DFS and the Advanced Disc Toolkit, which cost £24.15 and £35.50 respectively.

Future products for the Electron include a user port, 1MHz bus and a second processor interface to be released in time for Christmas.

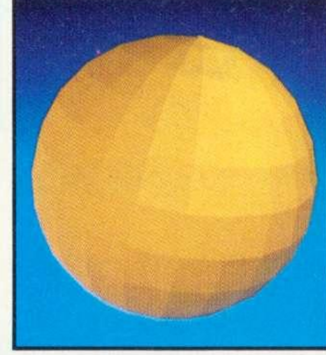
All prices include VAT and ACP can be contacted on (0276) 76545.

Juicy TV graphics on a Beeb

READERS in Wales should look out for the computer graphics on the pop chat show *Juice* which goes out on BBC TV on Wednesdays.

The animated graphics used to mark different sections of the programmes are produced on a BBC micro attached to a Pluto graphics system worth nearly £3000. Carl Blundell, who did the animation, said the graphics department was splashing out on a new Beeb for the series!

An early example of Carl's work with the Pluto is shown on the right. At present he is writing painting box software for the system.



Altra Tube Editor

ALTRA ROMS of Leeds announces a new Tube Editor, a full labelling disassembler and editor for use with the BBC micro, with or without the 6502 second processor. It claims it's the most advanced tube editor ROM available for the Beeb.

Labels, which are stored in user memory, can have up to seven characters with an associated two-byte address. There are 29 commands, and the output of a command can be sent to a printer.

The Altra Tube Editor costs £45. Further details from Altra, 209 North Street, Leeds LS7 2AA. Tel: (0532) 451508.

Board to add more memory to BBC micro

WATFORD Electronics has produced another variant on the ROM board. The ROM/RAM board increases the number of ROM sockets in the Beeb from four to eight, and up to eight sideways RAM banks can also be added.

Prices start at £43.70. Details: Watford Electronics, 250 High Street, Watford WD1 2AN.

New scope for micro education

FARNELL Instruments has brought out a BBC micro-compatible digital storage oscilloscope, the DTS12T. It costs £1374 and meets the IEEE488 bus specification.



The unit plugs into the Beeb's user port and includes software for Fast Fourier Transforms. Aimed at the education and training market, it will also connect to a XY plotter or YT chart recorder.

Make your own Mirror

by Geoff Nairn

FOR SOME time, Robert Maxwell has been trying to find cheaper ways of producing *The Daily Mirror* and his other Mirror Group titles. And it looks like he's come up with the answer – use a BBC micro.

For according to the publicity blurb for *Fleet Street Editor*, one of the latest releases from Cap'n Bob's software house, the package lets you produce your own newspapers using a BBC micro and a printer.

It claims to be a serious program, with headlines, illustrations and a selection of page layouts, and certainly the price of £39.95 (for two discs) seems serious enough. It will work with *View* and *Wordwise* files, and selects options by icon.

Among the interesting features are 'fast printer drivers' – an unfortunate turn of phrase considering Mr Maxwell's problems in getting (human) printers at *The Daily Mirror* to do any work at all.

The software will be available in December through dealers. Other autumn Mirrorsoft titles for the Beeb and Electron include: *Strike Force Harrier* (£9.95); *Mr Men Magical Storymaker* (£9.95); *The Invisible Mr Men* (price TBA); and *Crack It! Towers* (£9.95).

Teletext chip upgrade

USERS of the Morley teletext adapter who have not got ROM version 1.04a must send their old chip back to Morley for an upgrade.

The transmission format for Telesoftware is undergoing a change to the new RTF format.

The new ROM will work with the current format, the new format and the planned 8-bit data transmission.

Further details from Morley Electronics, 1 Morley Place, Shiremoor, Tyneside NE27 0QS. Tel: 091-251 3883.

Star prize

BUY A Star printer and you could also find yourself the lucky owner of a Porsche 924S, worth £15,000, in a competition organised by Star Micronics. Every buyer of a Star printer gets an entry form for the competition which is based on a quiz and the inevitable 'complete the slogan'. The competition closes March 1986.

Domesday runs out of data

THE BBC Domesday Project is recruiting tourists and local people in a bid to complete its computerised survey of Great Britain.

Schoolchildren have successfully surveyed most of the populated areas of the country and entered the information into BBC micros ready for sending to the BBC. But coverage of the upland areas of England, Scotland and Wales has proved less successful.

For this reason the BBC is displaying survey maps of these areas in libraries and information centres, and inviting people to survey one of the 3km by 4km blocks.

All that's required is a page of written description of the chosen area and a photograph. This information will then be sent to the BBC and entered on to a Vax computer, together with the more detailed information which schools have supplied on discs.

A Domesday spokeswoman denied that this was a desperate measure, but admitted that they had to abandon the idea of surveying the whole of Britain using school computers and were now relying on manual methods to complete the project.

By November of next year the BBC hopes to have an interactive video disc 'map' of the whole of Britain.

We thought it was about time we put you in the picture.



When we introduced our AMX Mouse to BBC Micro users, the response was phenomenal.

And no wonder!

It was regarded as 'pushing the BBC to its limits' and hailed by the press as 'probably the best input device that has appeared recently'. The AMX Mouse brought to BBC Micro users the same sophisticated, positive control that had, until then, been the province of the more expensive computers, like the Macintosh.

Now we announce a new enhanced software package which, can be used with a traditional keyboard or joystick but truly comes into its own when used with the AMX Mouse.

AMX Super ROM and Super Art adds colour to the features of the original AMX ROM, on a new 16K ROM.

It dramatically extends the original AMX ROM facilities to include Pull Down Menus, over lapping colour windows, colour patterns and an extended Icon set in all graphic modes.

Specially written to be usable with the vast majority of BBC Systems including 2nd processors, the Aries RAM Board, the BBC + Shadow mode, tape, DFS and ADFS.

The kernel of the Super Art program is included in the 16K ROM, providing tape and disc users with a Mode 1 colour drawing program.

But Super Art really comes into its own when used on a disc based system; a host of additional facilities can be selected direct from the screen.

Colour pictures can be created in dot resolution up to A4 size by scrolling the screen window, over the picture.

Other facilities include colour pattern editing – use of icons, additional text styles, various copy facilities and a superb colour Zoom.



Pictures can be printed out in colour (Integrex) or shades of black and grey on Epson compatible printers.

The results can be astonishing! – you can even store your finished 'masterpieces'.

The AMX Icon Designer facility gives you further freedom to design and store your own custom icons for use in your own programs.

This fabulous new package costs only £89.95 – a price as remarkable as the package itself – and includes a fully illustrated operating manual.

If, however, you are afraid of mice, you can purchase just the software package plus the 16K Super ROM for just £49.95.

You will still achieve some pretty remarkable results using your keyboard or joystick – not nearly as good as with the Mouse of course – but you can always add one later on for just £40.

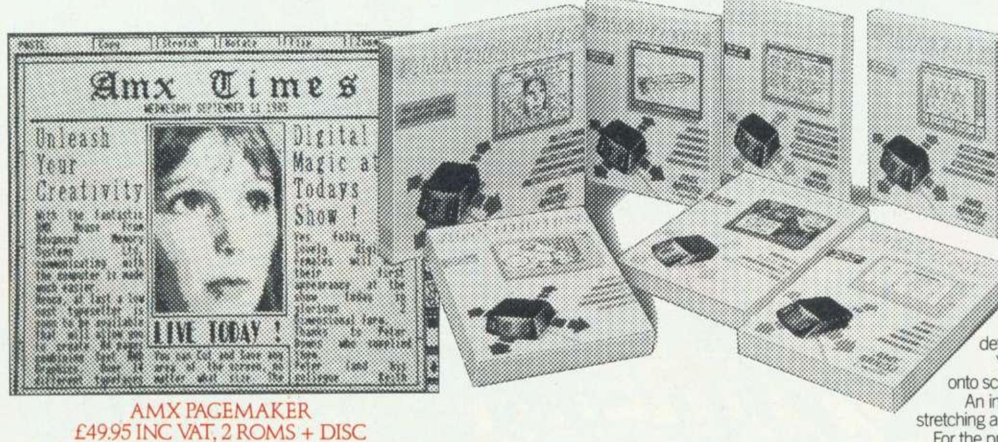
Then you'll really be 'in the picture'.



IMAGINATION AT YOUR FINGERTIPS.

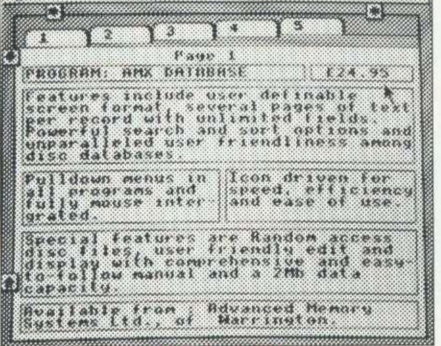
BOTH THESE EXCITING PACKAGES ALONG WITH OUR SUPERB RANGE OF AMX ROM AND SUPER ROM COMPATIBLE SOFTWARE ARE AVAILABLE FROM ALL GOOD COMPUTER DEALERS OR BY SENDING CHEQUE OR P.O. TO FREEPOST ADVANCED MEMORY SYSTEMS LTD., GREEN LANE, APPLETON, WARRINGTON, WA4 5NG.
FOR INSTANT ACCESS OR VISA ORDERS, RING (0925) 602959/602690.

Now you can stretch your imagination, without stretching your budget.

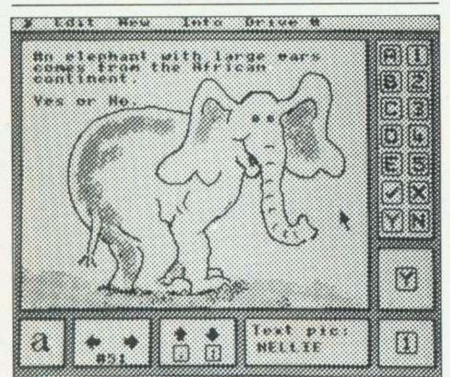


AMX PAGEMAKER
£49.95 INC VAT, 2 ROMS + DISC

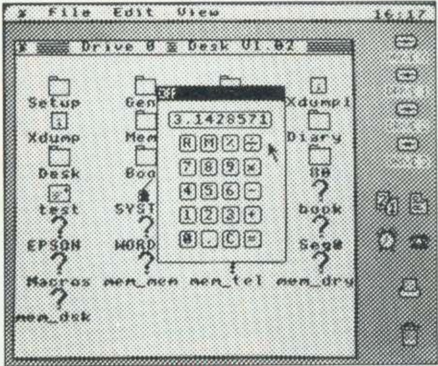
AMX 3D ZICON
£24.95 INC VAT, DISC



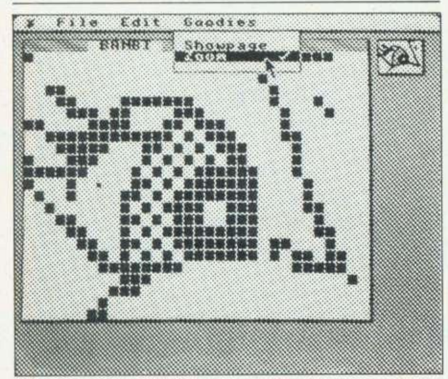
AMX DATABASE
£24.95 INC VAT, DISC



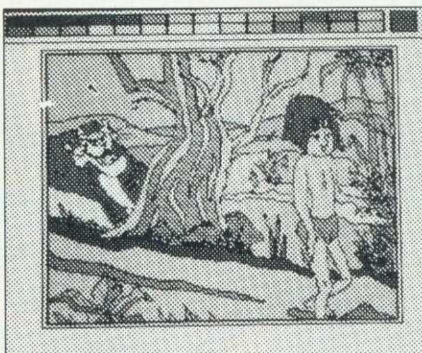
AMX XAM
£24.95 INC VAT, DISC



AMX DESK
£24.95 INC VAT, DISC



THE ORIGINAL AMX ART PLUS UTILITIES
£14.95 INC VAT, DISC



AMX PAINT POT
£14.95 INC VAT, DISC

From Advanced Memory Systems comes an irresistable selection of Icon driven software that AMX Mouse, ROM and AMX Super ROM owners can really get their teeth into!

Seven incredible programs, so comprehensive, they will more than satisfy even the most demanding BBC Micro user and when coupled with the AMX Mouse will broaden the horizons of the BBC Micro to new, undreamed of standards of sophistication.

AMX PAGEMAKER.

A fantastic high resolution A4 Typesetting and Artwork system.

Comprising 2 ROMS (8K and 16K) 'Pagemaker' features a fast scrolling A4 page.

There is a wide selection of typefaces and user definable fonts.

You can load in Wordwise and View files or type directly onto screen.

An incredible 'Cut and Paste' facility includes copying, rotating, stretching and zooming.

For the professional touch there is N L Q high quality dump, and you can dump any part of, or full A4 page.

AMX 3D ZICON.

Now, with a 3D ZICON you can transform three dimensional vector data and translate them into on-screen graphics.

You can Print or Plot graphics to suitable peripherals and produce output suitable for other AMX programs such as ART – UTILITIES and Paintpot.

There is even the facility to sketch in two dimensions and convert to three dimensions and auto swaps generator.

Some interesting example objects on file include – helicopter – jet plane and dodecahedrom.

AMX DATABASE.

Database is a brand new super filing program featuring 1000 records and unlimited fields per record.

It has a powerful search and sort facility and user friendly edit and display.

In fact it is probably the most advanced user friendly database available today.

Special features include: User definable screen format for record display – random access files – super fast sort – flexible printer dump and screen display.

AMX XAM.

A brand new and exciting educational program with maximum flexibility, allowing a multitude of options and variations.

With XAM you can create a multiple choice exam which would not be alterable by the examinee.

And you can incorporate within the questions, your own pictures, created on AMX ART, building the finished picture into the quiz and providing an extra and fascinating aspect to the examination.

AMX DESK.

The complete home or office acquisition.

You will wonder how you ever managed without AMX Desk.

Just point your Mouse and select the following additional aids:
MEMO-PAD for up to three pages of text
TELEPHONE/ADDRESS BOOK with 200 or 400 scrolling entries
DIARY with three months calender
ALARM to remind you about appointments
CALCULATOR – Yes! A full function calculator that cannot be lost or suffer flat batteries, and any window can be dumped to your printer at the touch of a button.

THE ORIGINAL AMX ART PLUS UTILITIES.

Now available as a single package – two of AMX's most popular programs.

AMX ART is a superb mode 4 graphics program, making full use of windows, icons, menus and pointers, it allows you to create your own pictures and the host of graphic features in AMX UTILITIES including a fantastic zoom facility for accurate amendments to your ART pictures – one dot becomes a character.

You can also move, copy, rotate, reflect, enhance circles, draw ellipses and arcs, even print icons.

Border can be added and pictures stripped and centred for saving and printing. All pictures can be loaded into AMX PAGEMAKER, AMX 3D ZICON, AMX XAM, AMX PAINT POT, and AMX SUPER ART.

AMX PAINT POT.

The pictures you have created with AMX ART and enhanced with AMX Utilities can now be coloured in, using PAINT POT.

They will burst into life with rich, vibrant colours, and with a palette of 256 different shades you should not be short of inspiration.

You can even store up to 20 Illustrations in Picture Show mode, then display them in sequence.

To start you off we have included eight exciting pictures in the program.

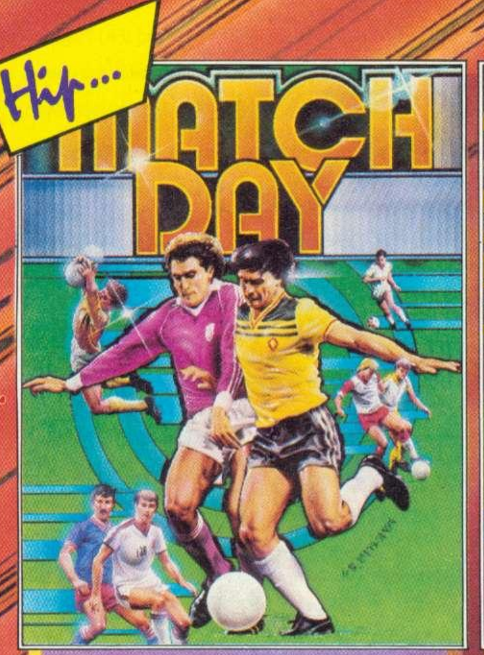


IMAGINATION AT YOUR FINGERTIPS.

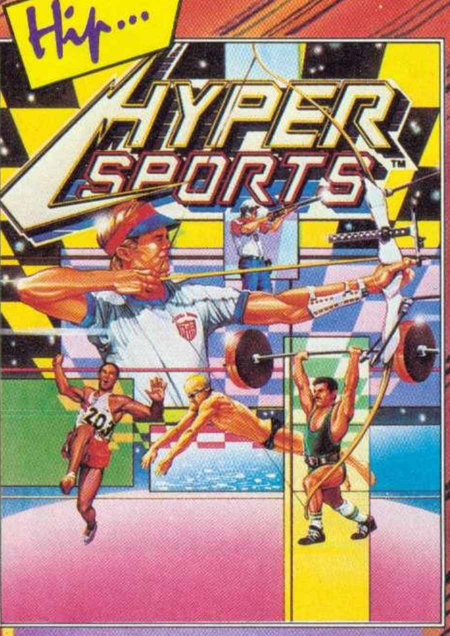
ALL THESE EXCITING AMX ROM AND AMX SUPER ROM COMPATIBLE SOFTWARE PACKAGES ARE AVAILABLE FROM GOOD COMPUTER DEALERS OR BY SENDING CHEQUE TO PO TO FREEPOST ADVANCED MEMORY SYSTEMS LTD, GREEN LANE, APPLETON, WARRINGTON WA4 5NG.
FOR INSTANT ACCESS OR VISA ORDERS TELEPHONE (0925) 602959/602690.

3 CHEERS FOR THE BEEB!..

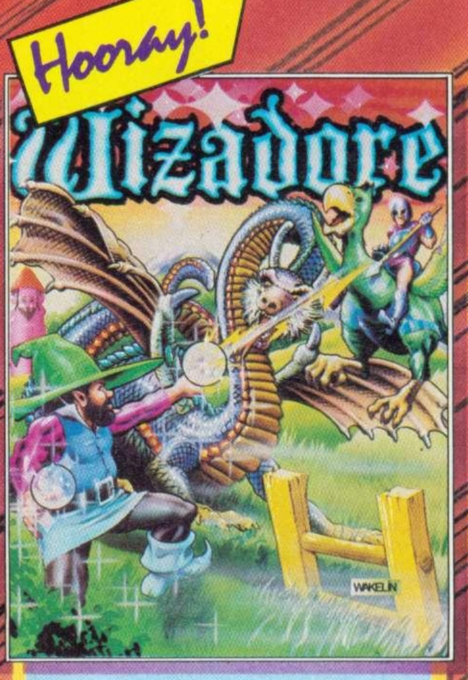
Hip...



Hip...



Hooray!



Match Day is no ordinary soccer game. Blistering 3-D action and total animation bring the thrills and spills of football to life through your BBC.



9.95

You will marvel at the depth of play and ball control as you develop your skills and techniques playing against the computer or in knock-out competition. Match Day – shoot to win!

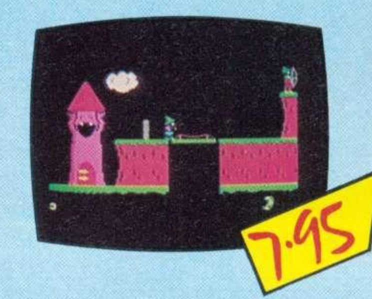
Now Konami's No.1 arcade hit is available for your BBC Micro. Six events to test your skill and stamina – the pin point accuracy



9.95

of Skeet Shooting and Archery, the athleticism of the Triple Jump and the Long Horse, the sheer stamina and endurance of Swimming and finally the precision timing and power of Weight Lifting. Sharpen your wits and build up your strength as you enter the stadium where 'Track and Field' left off.

A journey into the mystical land of 'Wizadore'. Enchanting graphics present a most amusingly animated array of



7.95

dragons, goblins, castle and many more colourful features with stunning sound effects to bewitch your imagination. The spell of Wizadore will keep the whole family entranced with fun and excitement as you venture through a timeless land with a magical finale.



Screens for BBC may vary from the example shown above.

imagine ..the name of the game

Ocean Software Limited · Imagine Software (1984) Limited · 6 Central Street · Manchester · M2 5NS
Telephone: 061 832 6633 (Ocean) · 061 834 3939 (Imagine) · Telex: 669977

All three games are available from:
Boots, WHSMITH, John Menzies, WOOLWORTH, LASKYS, Rumbelows, Greens, Spectrum Shops and all good software dealer

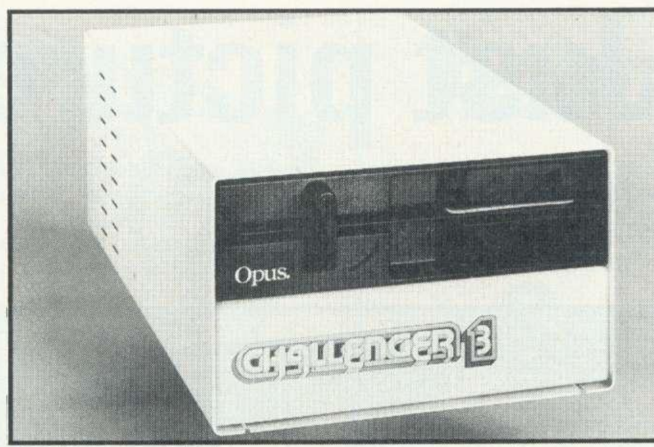
Program piracy: an optical answer?

THE latest weapon in the war against unauthorised software copying is Lenslok, an ingenious optical security system from ASAP Developments Ltd which could be used on BBC and Electron software on this side of Christmas.

Lenslok is a plastic lens, unique to each game. It is used to decode a pair of randomly chosen characters which appear on screen whenever a program is run and which must be typed in before the software can be used.

The software patch which scrambles the characters has been written to cope with all types of monitors and televisions with all screen sizes. The cost of adding Lenslok to a piece of software is expected to be under 20p.





Challenging!

OPUS Supplies has released the Challenger 3 for the BBC micro. It combines a 5.25in disc drive with built-in double density disc interface plus a 256k RAM disc for £249.95 inc VAT. The unit offers an easy disc upgrade, requiring the insertion of a single paged ROM, and plugging the unit into the 1MHz bus.

The disc drive is a standard Opus 80-track drive which can work in 40-track mode.

The RAM disc allows programs and data to be saved and loaded instantaneously with all the normal Opus DDFS commands available to it.

As the RAM disc appears as drive 4 to the BBC micro (selected with *DRIVE 4) and the Challenger 3 plugs into the 1MHz bus, it is still possible to use a standard Acorn DFS (or similar) plus disc drive attached to the more conventional disc drive port.

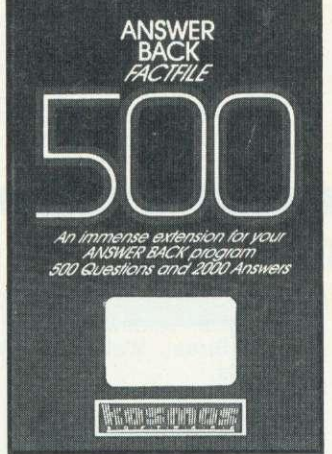
The RAM disc itself may be upgraded to 512k for £49.95.

Further details from Opus Supplies on (0737) 65080.

Longer life for schoolquiz

QUIZ fanatics can extend the life of their **Answer Back** software from **Kosmos** with a range of cassettes and discs with 500 questions on 13 subjects from spelling to football.

Each of the **Factfile 500** titles (right) costs only £3.95 for the cassette or £5.45 for a disc. They all work with the Junior, Senior and Sport versions of *Answer Back*. A pat on the back to Kosmos for a mind-improving idea.



Dorset coastguards are the subject of **Search and Rescue** from **Storm Software**. This game is in the classic simulation mould, giving children from nine upwards the chance to react to a problem based on real-life events. The starting conditions can be changed to alter the game and give varying levels of difficulty. The disc pack costs £17.65 plus VAT (£1 extra for 80-track) and includes notes for children and adults.

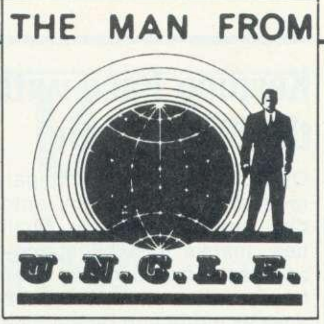
Starters Software has more than 100 programs on the BBC, Electron and RML available for use in schools from as little as 50p each. The selection covers everything from simple utilities to adventure games. Free catalogue from 3 Allt View, Bwlch, Brecon LD3 7HJ.

Information retrieval in primary schools is apparently made easier with **Grass** (graphics, searching and sorting). The program costs £25 plus VAT, and education authority licenses are available. Contact Roger Keeling, Newman College, Genners Lane, Birmingham B32 3NT.

Softlee Systems puts both computer programs and recorded sound on to one tape by splitting them on to separate stereo channels. Three tapes on learning French based around O-level revision cost £6.50 each for the BBC or Electron. Details from Softlee Systems, 35 Windy Arbour, Kenilworth CV8 2AT.

Two business training packages for schools and colleges cover the basics of stocktaking and run on the BBC micro with either Epson or Canon printers. **Stockcheck** costs £19.50 for schools or £27.50 for further education colleges. **Stocksystem** costs £33.50. Both come on disc with a licence to make copies. Details from R Reeves, 24 Carthona Drive, Fleet, GU13 9SF.

THE MAN FROM



Our regular columnist reports on his jaunt to the last *AU* Show – and looks forward to the next one.

ANOTHER exhibition before Christmas! I haven't got over the last one yet. Jam-packed as usual. People plastered all over the Barbican walls. Cheery cries of the costermongers – 'Git your romboards 'ere. Lowest prices, oi oi oi.' It was great to be in London again. What fun asking London Transport employees for directions (don't they know 'Tube' is a registered Acorn trademark?). Would it be the 'Don't interrupt me now, pal. I'm communing with my ancestors', or the snarl, or perhaps the yawn?

Anyway, with the aid of my Elephant Man disguise I was able to mingle unnoticed with all you exhibitionists without being pestered for autographs. All went well until somebody finked on me to the Acornsoft mob. Seems some Fellows was a trifle piqued at my totally unfounded allegation that some of their new ROMs don't work across the Tube. I felt obliged to retire to the lavvy but two heavies rumbled this feat of low cunning and winkled me out in no time. My usual ploy on such occasions is to distract them by admiring the fine filigree work on their brass knuckledusters and the polish on their toe caps, but these were men of purpose. Between screams I tried to tell them it was Bruce Smith who had given me the bum steer and who ought to be the object of their attention.

Finally, Bruce did the decent thing and took my broken body back to King's Cross in a wheelbarrow, much to the joy of the LT men whose slumber I had disturbed earlier.

The BR chaps weren't much better. Seeing my condition and the tartan socks, they assumed I was Scots and began poking me with pointed sticks, driving me towards the guard's van, cursing and shouting 'Jockroach!'

Not a bad day out, but perhaps the next will be a little less taxing.

Keeping Pace with the Nightingale

OWNERS of the Nightingale modem can now enjoy auto-dial and auto-answer facilities, thanks to a Nightingale accessory board. In addition, baud rates and originate/answer mode can be selected from software.

The board costs £56.35 and software to work with the Commstar communications program costs £11.50. Pace Micro Technology, Juniper View, Allerton Road, Bradford.

Flock of Kiwis

ONE FOR our New Zealand readers: the BBC Micro Users Group in New Zealand now also welcomes Acorn Electron owners and so it's changed its name to the BBC/Acorn Computer User Group. The Group has been going since 1982 and now has some 400 members. Information from PO Box 9592, Wellington, New Zealand.

Micro composing

LOUGHBOROUGH University is running two weekend workshops for musical micro users: 'Music on the BBC microcomputer' from 25 to 27 October and 'Writing music software for the BBC microcomputer' from 29 November to 1 December. The workshops – £70 each, including full board – are intended for music teachers who want to get to grips with music-making on the Beeb. Full details from the Centre for Extension Studies (PR), Loughborough University, Loughborough, Leics LE11 3TU.

Exhibition winners

THE winner of the First Prize at the Acorn User Exhibition, a BBC B+ micro, was Justin Wise, of Barnet, Herts.

Second Prize winner Andrew Denny, of Surrey, wins an Electron.

The 45 winners of a sweatshirt and *Acorn User* graphics cassette were C Shipton, C M Digweed, N G Smith, W L Hodges, A Chowdhary, P French, S Spencer, M Beaton, B Eastwood, K A Johnson, B Conway, J G Phillips, D E Evans, P Ranson, D J Freeman, B P Gurden, A. Rawnsley, G Watts, M Andrews, M A McHugh, L Mack, K Axon, S A Langton, L Gladstone, N Church, G M Potter, A Lines, A Stephens, P Clark, K Brough, J Campbell, J Goldner, A L Grey, K Crosbie, J Fong, J Godfrey, S Lazareno, R L Chevasco, A Ircha, J Ingle, J S Sethi, S McCullum, C Brockie, T King, A May.

Just picture this

BBC MICRO graphics have shot to fame with exposure in the *Sunday Times* colour supplement (below) and the cover of *Time Out*, the weekly London entertainment guide (right).

The same artist, Jonathan Inglis, was behind both pictures. He produced them on a standard BBC micro using Rob Fenton's *Paintbox* software published in January's *Acorn User*. He adapted the program to allow mixing of colours, and included some of his own routines. Another sample of Jonathan's work appeared with Martin Phillips' article in September's *Acorn User*, using the Easyplot program described. Readers might also recognise his name from *The Friendly Computer Book* (BBC Publications, 1983) which he wrote and illustrated.



Computer graphics are not usually regarded as good enough for magazine illustration, because of the low screen resolution and the jagged line effect which results. However, Jonathan's 'tapestry' style is ideally suited to computers, and even makes a virtue of the micro's graphics vices.

Mystery fire threatens Raleigh dragonfly data

AS *Acorn User* went to press, team members of Operation Raleigh were anxiously awaiting news about a fire at the Tambopata Wildlife Reserve in Peru, where a BBC micro was used for storing information.

The cause of the fire, which burnt down the reserve's lodge, was not yet known, but if the Beeb has been destroyed then valuable scientific information on the wild life of the area is almost certain to have been lost.

Operation Raleigh was at the reserve has a very high diversity of species – especially birds, butterflies and dragonflies. Until recently the Tambopata area was one of the least disturbed in the Amazon Basin, but the arrival of a new road has threatened this and the OR team was there to monitor any changes

In the Electronic Village

SID Shorthand and Wally Wordsmith are two of the characters in the *Village of Spellwell*, whose adventures you can follow in the Electronic Book.

The touch-sensitive Book connects to a BBC micro and comes with overlays, reading book, audio tape and software. Children follow the story and ask questions by pressing on the overlays, and the answers come up on the screen.

It is aimed at children aged three to seven and costs £14.95. The *Village of Spellwell* adventure costs £24.95. Further details from Tandy Computers, Tameway Tower, Bridge Street, Walsall, West Midlands.

Logo mag arrives

A NEW education magazine has just appeared, published by the folk who created LSL Logo. Called *Logo User*, it's aimed at teachers and others concerned with implementing Logo in education. An annual subscription (three issues) costs £3 from 316a Richmond Road, Twickenham, Middlesex TW1 2PD.



How to net a cash prize

MICRONET subscribers can now race around the country, picking up clues and working towards a £100 cash prize – without leaving their terminals. *Round Britain Race* is a multi-user game which thousands can play: within weeks of its appearance last month, Micronet had registered 150,000 accesses to the game from over a thousand players.

Every fortnight there is a new theme and you have to use your general knowledge to suss out the hidden locations, directing your cursor over a screen map of Britain. Clues flash up occasionally to tell you if you're getting warm.

You can submit your entry via the Micronet mailbox. And once a fortnight, a lucky subscriber is informed by the same means that he or she has won the £100 prize.



Tapping into Urdu and Arabic

by Bill Penfold

THE Halifax Information Technology Centre is developing a hardware-software package to convert the standard BBC micro keyboard into one showing the Arabic or Urdu alphabet. The hardware part is a plastic overlay which sits on top of the normal keys and uses their pressure to spring back. The keys can then be re-defined, either by software on disc or tape or with firmware, such as ALK's new Arabic ROM (01-669 1125).

It does not, of course, have to be Arabic. If the overlay goes into production the idea is for each key to have a detachable clear plastic cap enabling whatever character is required to be shown on the key. Overlays could be used to provide the Beeb with a variety of alternative alphabets, Cyrillic, Greek, Glagolitic, etc, once the keys have been re-defined with suitable software.

This is the more difficult half of the Halifax package. It has to re-define the keys from Roman characters into Arabic script – and enable the machine to write right to left instead of left to right.

Andy Jackson, in charge of the project, reckons the package, if judged to be commercially viable, will cost about £50 with software to do the re-defining. However with the arrival of Acornsoft's new ROM, it seems more likely that the overlay alone is going to be the main interest of most potential users.



The prototype Arabic overlay

Acorn User Reader Services

AS a result of pressure from readers, *Acorn User* has decided to launch a guaranteed fast reply service for enquiries. Your answer will be returned within five working days for just £2 (includes VAT), or your money back.

The idea is simple. Just write out your problem, fill in the coupon below, and send both off to *Acorn User* with a stamped addressed envelope and cheque or postal order for £2. Make sure you include as much detail as possible and a disc or cassette if a program is involved – with enough space to record any corrected listing.

We will then answer the problem and return all material received – within a guaranteed *five working days* from receipt – in the sae. If we fail to match this promise your cheque or postal order will be returned with the answered question.

If we cannot answer the problem, the cheque will be sent back to you.

This service has been set up because so many readers want a fast answer, which we do not have the staff to provide. Under this new system, special technical staff will be available who can give the fast, guaranteed turnaround required.

Whether you want a listing debugged, advice on hardware or software, or a list of addresses, send your problems to Reader Services, Acorn User; Redwood Publishing, 68 Long Acre, London WC2E 9JH.

ACORN USER READER SERVICE
68 Long Acre, London WC2E 9JH

Name ....

Address ....

....

..............................Post code ....

Daytime phone number ....

I enclose a cheque/postal order for £2 and an sae with my problem.

OFFICE USE ONLY Date in:
Date out:
Answered by:



Cliff Richard's *Living Doll* becomes reality with the aid of a computer in the film *Weird Science*. A bunch of schoolboys use their home micros to turn a Barbie doll into a real woman (Kelly le Brock). You'll have to see the movie to discover the significance of the uplifting headgear

On film

□On general release from the end of October is *Weird Science*, described as a 'contemporary screen comedy' in the *Electric Dreams* mould. It features two high school whizz kids who, with the help of a few home computers, manage to create the world's most beautiful woman out of (stop laughing at the back) ... a Barbie doll. With the inevitable soundtrack of pop songs *Weird Science* is apparently doing great things in the States.

On television

□*Micro Live*, BBC 2, 7.00pm, Fridays (repeated at 5.30pm on BBC 2 each following Monday). Lined up for the October 25 programme is a half-hour film on computers and music, which shows some of the technology employed by a hopeful young band in putting together their first LP. The next week's programme shows you what you can do at home using Acorn's Music 500 and other cheap computer synthesisers.

On show

□16-18 October, Computer Graphics 85, Wembley Conference Centre, London. Three days of the latest hardware, software, systems and services in computer graphics

□19 October, Big Ben Club National Day, Technical School 'De Vechtstreek', Breukelen, Netherlands. National society for Beeb and Electron users' show.

□7-11 November, Hobby Elektronik, Stuttgart, W Germany. Exhibition aimed at computer and electronics hobbyists.

□19-21 November, Microcomputer Week, Hall 2, Messe Essen, W Germany. Exhibition of personal computers.

□25-28 November, Gulf Computer Exhibition, Dubai Trade Centre, Dubai. In its fifth year and seemingly going from strength to strength.

On holiday

□Fancy a well-earned rest? Well, deep in glorious Devon you can get right back to basics. Micro-Aid is holding a series of weekend breaks at the Three Crowns Hotel in Chagford, Devon, where you can 'get to know your computer better', as well as enjoying some more usual holiday pursuits. Weekends available: 18-20 October and 22-24 November. Cost is £89 for a double room; further details from Micro-Aid on (0209) 831274.

To contact

□Technomatic's bulletin board service, containing information on the products the company stocks, is open 24 hours on 01-450 9764. Baud rate: 1200/75.

□Acorn (0223) 245200.

□Acorn's own bulletin board service is Prestel-compatible (1200/75) and runs on (0223) 243642.

□BBC TV's *Micro Live* bulletin board is on 01-579 2288 (type INFO BBC on Telecom Gold electronic mail system).

□BBC Computer Literacy Project, Broadcasting Support Services, PO Box 7, London W3 6XJ. Please send sae.

□Bulletin Boards:
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Technomatic 01-452 1500
TBBS London 01-348 9400
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□CABE (Computers and Adult Basic Education), c/o John Taylor, Harrison Adult Education Centre, Lower Hollin Bank Street, Blackburn, Lancs. A new address for this user group for tutors in adult and further education.

□MEP (Microelectronics Education Programme), Cheviot House, Coach Lane Campus, Newcastle-upon-Tyne NE7 7XA. Hardware and software support for schools. Please send sae.

□MAPE (Micros and Primary Education), c/o Barry Holmes, St Helen's Primary School, Bluntisham, Cambs. User group for primary teachers. Please send sae.

□MUSE (Micro Users in Schools and Education), Freepost, Bromsgrove, Worcs B62 7BR. User group for teachers and parents. Please send sae.

□National Extension College, 18 Brooklands Avenue, Cambridge CB2 2HN. Educational and training courses on the BBC micro. Please send sae.

□CET (Council for Education Technology), 3 Devonshire Street, London W1N 2BA. Government body which oversees MEP. Please send sae.

For help

□To contact *Acorn User* authors, write c/o the editorial address given on page 2.

□Seikosha AP/GP100 printer help sheets are available from *Acorn User* for 50p, plus sae. These consist of three programs, including a screen dump, and three pages of notes on using these printers.

□Monitor choice: photocopies of the review of four monitors plus a set of nine test programs from the June 1984 issue cost 72p (inc post). A copy of the issue costs £1.25 (see page 92).

□Bulletin boards: information on 26 free-access boards was given in the October 1984 issue. 54p for photocopy (see page 92).

□For *Acorn User* cassettes, discs, back issues, binders, contact PHS Mailings on (02934) 72208 (see page 96).

Blunderbox

□A few bugs crept into Martin Phillips' three short listings on page 83 of the September issue. The correct versions of the lines involved are:

```
  240 B%=1:1%=0:h%=0:ang=0:P
RINT"Enter dimensions Y/N ":
PROCg:IFA$="N"GOTO244 ELSEIN
PUT"Enter length or press re
turn "1%:INPUT"Enter height
or press return "h%:IF1%*h%=
0:INPUT"Enter angle "ang:ang
=0.0001+RADang
  244 PROCe:PROCp:REPEAT:PRO
Ca:IF1%+h%>0 x%=X%+1%:y%=Y%+
h%
  252 PROCe:PROCp:REPEAT:PRO
Ca:IFh%*1%>0:x%=X%+1%:y%=Y%+
h%
  262 ang=RAD(ang):PROCe:PRO
Cp:PROCf(x%,y%):REPEAT:PROCa
:IFc%>0:PROCf(x%,y%):x%=X%+c
%*COSang:y%=Y%+c%*SINang:PRO
Cf(x%,y%)
```

□Last month we said that Chris Steele's *Freehand* program would work on the Electron. A few changes are required however and these are given on page 111 of this month's yellow pages.

□The diagrams in October's Atom Forum contained just a few errors:

In figure 2 there should have been no direct connection between pin A and the upper 74LS00. The only direct connection should have been with the lower 74LS00.

In figure 3 an inverter (LS04) should have been included between pin F and the 74LS27.

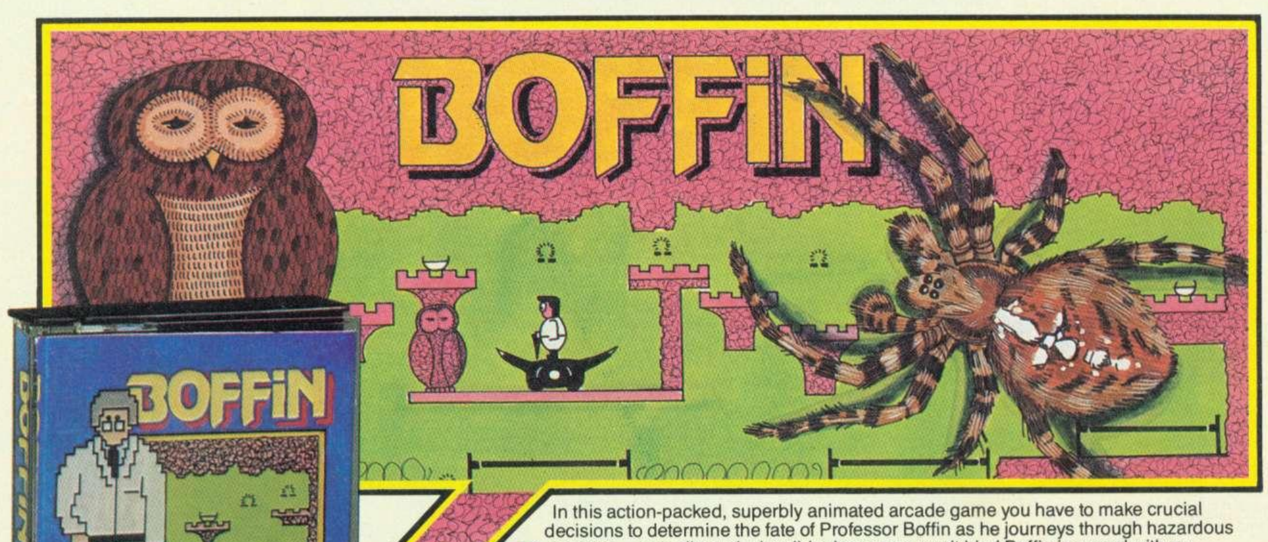
In figure 4 a zero should have been included in the triangle in the top-left corner of the 74121. That is, the trigger should be the drop from 5 to 0 volts rather than the rise from 0 to 5.

In figure 5 an inverter (LS04) should have been shown on the BAR-G line before the G line connects. Similarly, an inverter should also have been shown on the BAR-H line before the H line connects.

If readers would like to write or telephone us we would be happy to supply a copy of the corrected circuit diagram.

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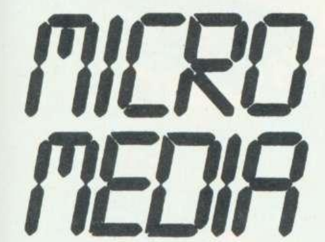
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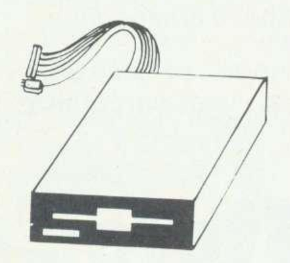
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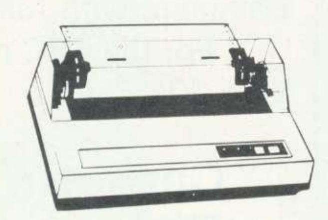
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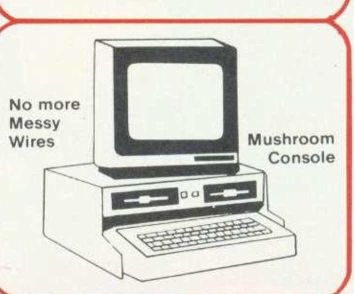
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107 MEMO-CALC £12.95 B C/D
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Database/calcsheet program which allows up to 255 columns. The number of rows is automatically set from 5 to over 1000 depending on the columns declared. Both numeric and alphanumeric data can be stored in any cell and can be of any length up to 255 characters.

There are a multitude of uses for this program from accounts to diaries, club or personnel records etc. and is probably the one program that we all need. MODE7
107a Manual for MEMO-CALC included free otherwise £2.00 (0% VAT)



Part 1 is a BASIC program running in MODE7 which accepts new data on employees, allows additions, deletions and alterations, listing of P35 & automatic alterations to the codes as required by tax notice P7X. Fully 'user friendly' with colour and graphics to make life simple for the operator.
Part 2 (WEEKLY) or Part 3 (MONTHLY) is designed to handle the calculations of wages and N.I. It allows for standard pay, two overtime rates, optional pension funds (monthly only) other pay, holiday pay, bonuses, post-tax adjustments and no pay.
106b COIN ANALYSIS £4.95 B C/D
106c PENSION £4.95 B C/D EXTRA
106d PAYSLIP FORMS £25.00 per 1000 EXTRA

Buy direct or Prestel No. 25821534.

£27.95 + VAT

CASHBOOK

102 CASHBOOK £11.95 B C/D
FIRST CHOICE This is a double entry cashbook program showing cash and bank credits and debits. i.e. 4 columns. Any number of individual accounts can be used and analysed or totalled individually or cumulatively by associated group. A friendly but very practical, and reliable program which despite its low cost is used by many people in a range of situations from domestic and clubs to schools and businesses. MODE7
102d CASHBOOKd £19.95 B D
SECOND CHOICE This version of the above program uses random access disc files and can hold up to 1250 entries on 100K discs and up to 2500 on 200k discs. There is sophisticated protection against unauthorised use built in. MODE 7
102f ACCOUNT £29.95 B D
THIRD CHOICE This version of the above program uses random access disc files and an hold up to 1100 entries on 100K discs, and up to 2250 on 200K discs. Included is a choice of CASH/BANK or VAT/BANK headings. Over 830000 possible accounts combinations. Ledger sheets and summaries can be printed as well as full accounts. The latest balance is available at any time. This program is only available on disc MODE 7

NEW

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(Page * 2582020) using your Access Card

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Basic 3 For BBC Computer With Sideways RAM

Until now, only the lucky 32016 co-processor owners could afford to have 10,000 strings or variables at once in their programs. But now with the Solidisk Basic 3, you too, can play with similar facilities.

The Acorn's BAS128, as implemented at present on the 128K BBC PLUS, occupies the main user memory and uses 4 Sideways RAM banks to store both the program and the variables.

The Solidisk BASIC 3 is an overlay for the BBC BASIC 2, occupies 1 Sideways RAM bank, uses other Sideways RAM banks to store variables and leaves the program in the usual main memory.

The Solidisk version has some significant advantages, mainly:

1) The Solidisk BASIC 3 offers more space:

	BBC B	+SWR32	: +SWR64	+SWR128	+SWR256
Size for BASIC:	25.5K	37.5K	: 69.5K	133.5K	261.5K
128K BBC PLUS					

2) The Solidisk BASIC 3 is faster than BAS128, for example in running PCW Basic Benchmark (PCW January 85):

COMPUTER	TIME IN SECONDS	RANK
BBC B + 6502 SECOND PROCESSOR:	9.58	1
BBC B + BASIC 2	14.27	2
BBC B + BASIC 3	18.99	3
ELECTRON	20.44	4
BBC 128K PLUS + BAS128	29.43	5

3) The Solidisk version loads, saves and runs programs in the usual main memory thus requiring no change to the programs.

4) The Solidisk version is available on disk and in ROM (as part of STL TOOLKIT ROM), BAS128 is available only on disc.

Solidisk Sideways RAM is compatible with all issues of BBC computers along with most current add-ons.

To date, more than 45,000 Sideways RAMs have been sold.

Sideways RAM is similar to Sideways ROMs such as the BASIC ROM or the DFS ROM but it can be written into. This means that Sideways RAM can run all types of software that are normally available in ROMs.

Solidisk also has a large library of nearly 100 programs to maximise the use of Sideways RAM.

These include important software such as word-processor, database, spreadsheet, spelling, checker, macro Basic, Extended Basic, Virtual Memory, Index, Sprites, RAM Disc, Machine Code monitor, Digitised pictures, SFX etc... and entertaining computer games (Blitz, Meanies, Escape, Seawolf etc).

THE NEW STYLE SWR64 AND 128K:

Solidisk have introduced a new style for the SWR64 and the SWR128.

The new RAM card has the capacity of 64k or 128k, upgradable to 256k and TWO intelligent ROM sockets accepting up to 64k of ROMs.

Each 32k EPROM (or 27256 EPROM) is treated as TWO separate 16k EPROMs and occupies 2 adjacent Sideways ROM banks.

You can use for example STL TOOLKIT + STL WORD PROCESSOR in one, DFS 2.1 and ADFS 2.1 in the other.

If you want to blow 32k EPROMs yourself, you will need the UVIPROM32, a new version of the UVIPROM Eprom Programmer capable of programming the AMD 27256 EPROMs (Programmer: £20.00, Eproms £10.00 each).

PRICES

The listed price comprises the Sideways RAM fully guaranteed for 1 year, comprehensive manual and software pack 1 consisting of 5 diskettes formatted either in 40 or 80 track.

— SWR32 + 5 discs (32k unit, by far the most popular): £53.00
— SWR64 + 5 discs (64k unit, new introduction model): £80.00
— SWR128 + 5 discs (128k unit, the second most popular): £125.00
— Any Extra Software Pack (5 discs): £10.00 Specify 40 or 80 tracks.

As Solidisk Software Support Service has to produce in excess of £25,000 diskettes every month, we regret that we can no longer provide personalised service for disk washing. In extreme cases, when you need to update your software diskette, either reorder a new software package (which is always sold to you at nominal media cost i.e. £10.00 for 5 disks, including new manual, or return the old package with £2.00 to cover post and packing. You may avoid post and packing costs if you call at Solidisk's stand at any BBC micro exhibition or at the Solidisk office.

UPGRADING

Upgrading from a smaller model is very simple: you return the old RAM board to us with your payment for the difference.

The listed prices include new manuals when necessary.

SOFTWARE PACK 1
(included with SWR)

The Software package comprises 5 diskettes, formatted either in 40 or 80 track. Please specify when ordering.

Volume 1:
Volume 1 contains all the general applications of Sideways RAM. Menu, Printer Buffer, STL DFS 2.0, STL E00, RAMDISK, RFS (Rom generator), Fast Backup, Quickcopy, Index etc...

Volume 2:
Volume 2 contains the Solidisk Wordprocessor, Spelling Checker and the English Dictionary.

Volume 3:
Volume 3 contains the Solidisk Macro Basic (a program generator), a Linker-Editor, VMP the Virtual Memory Program, Sigen, a program to create your own dictionary and a sample French dictionary.

Volume 4:
Volume 4 contains the Solidisk Database.

Volume 5:
Volume 5 contains the Solidisk Sprites System.

SOFTWARE PACK 2
(optional)

Volume 6:
Volume 6 contains the Solidisk Spreadsheet.
Menu driven with standard options to create, edit, recalculate, print, search, sort, report generator and mailmerge.
Unlimited number of rows and columns. Each column can be as small as 2 or as big as 70 characters. All math functions are supported. Complete with home banking and simple portfolio management.

Volume 7:
Volume 7 contains Solidisk Play Tunes System and lots of tunes and write music using ordinary ABCD notation.

Volume 8:
STL Toolkit has 24 star commands (Status, Rwipe, Check, Find, Search and Replace, Mode 8, Join, Keyload, LVAR, Salvage, Expand, Edit etc...).
STL SFX is Solidisk screen effects utility. In mode 2, you can scale, move, reverse, mirror etc with superlative ease.
VDURECORDER is another screen aid utility. It remembers everything sent to the screen. When you want it, *REPLAY will show it all over again but with an incredible speed.
Solimon is a machine code monitor for both 6502 and 65C02.

Volume 9:
Volume 9 contains the STL ADFS and disc utilities (see next page).

Volume 10:
Volume 10 contains the Solidisk Teletext Editor.

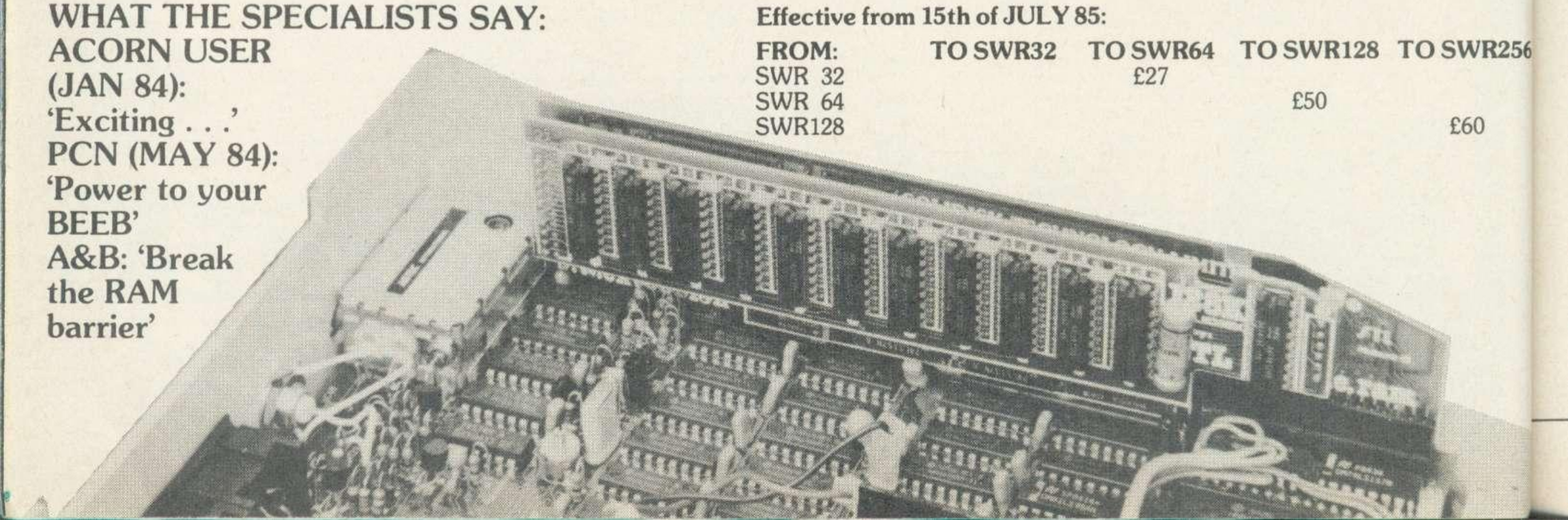
Megagame Packs:
Around 70 games are currently under compilation.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

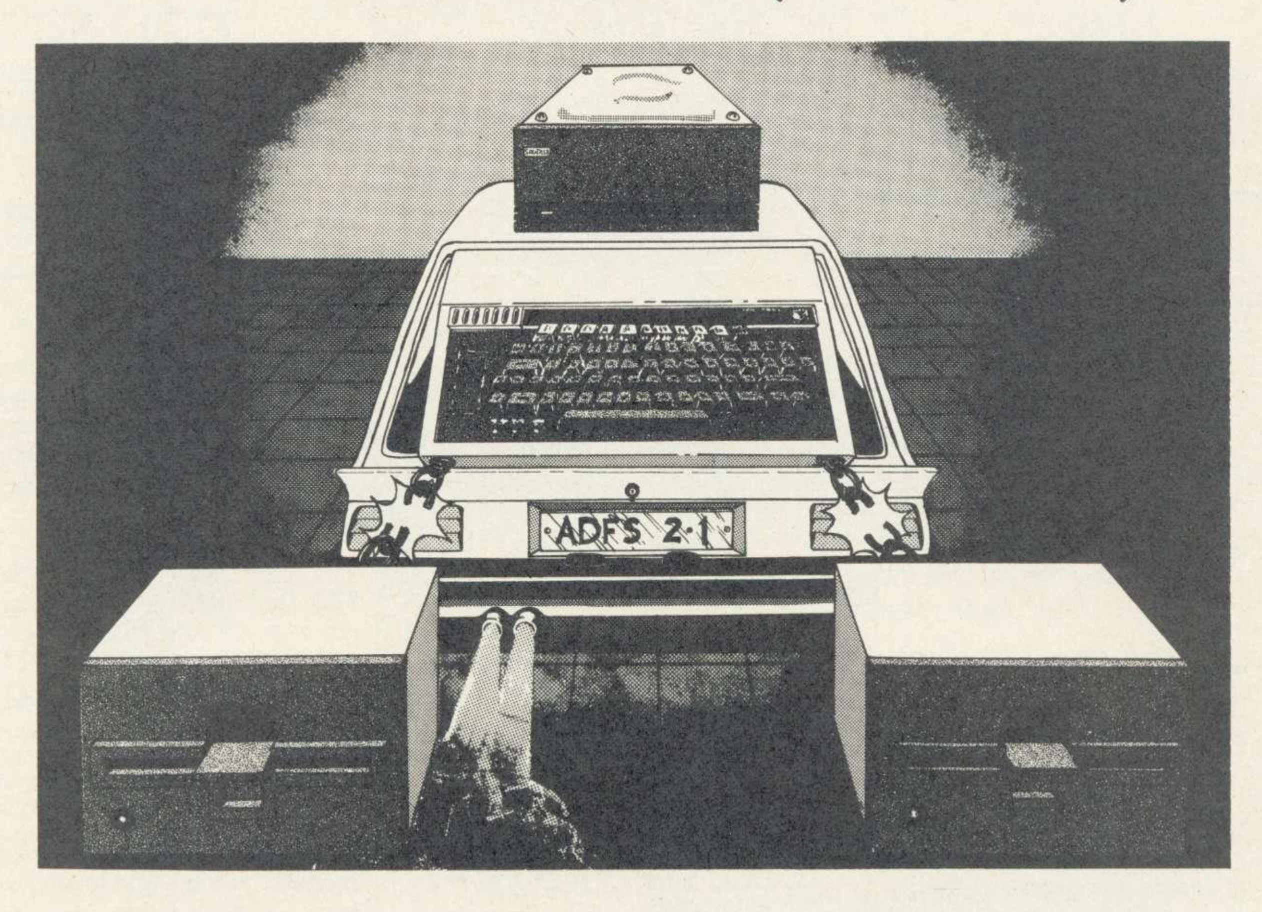
WHAT THE SPECIALISTS SAY:
ACORN USER (JAN 84): 'Exciting . . .'
PCN (MAY 84): 'Power to your BEEB'
A&B: 'Break the RAM barrier'

Effective from 15th of JULY 85:

FROM:	TO SWR32	TO SWR64	TO SWR128	TO SWR256
SWR 32		£27		
SWR 64			£50	
SWR128				£60



LOAD AND RUN IN 100 MILLISECONDS (Or Less). . .



Would you believe that your BBC Micro will LOAD and RUN a small BASIC program from your Winchester in less than a TENTH OF A SECOND?

Yes, it's perfectly true when you have a Winchester hard disc for it.

How well does your BBC computer compare against the best sellers in 'business micros' such as the IBM PC, the APRICOT, the COMPAQ or the SIRIUS?

Eric Bagshaw, of the prestigious National Computing Centre has devised a series of tests to reflect as closely as possible the performance of various business computers in actual use.

He put computers like the APRICOT, COMPAQ, FORTUNE, IBM, RAIR, SIRIUS, XEROX etc. . . through the same tests and published the results in the November 84 issue of PCW and the July 85 issue of Practical Computing but he missed out an important one: the BBC computer.

We had to wait until Gordon Taylor, journalist and reviewer for A&B Computing adapted the Bagshaw Disc Benchmarks to run on the BBC. We were quite astonished by the findings. Just look at the figures below:

BENCHMARKS	WITH FLOPPY*	WITH 20 MB HARD DISC**
BM0 *LOAD SIXTEEN	1.94	0.87
BM1 WRITE SEQUENTIAL FILE	9.57	2.86
BM2 READ SEQUENTIAL FILE	4.30	1.84
BM3 WRITE RANDOM FILE	22.62	10.37
BM4 READ RANDOM FILE	10.20	8.54
BM5 MULTI OPEN AND WRITE SEQ.	68.77	19.29
BM6 MULTI OPEN AND READ SEQ.	4.29	1.54
BM7 MULTI OPEN AND WRITE RANDOM	70.63	19.74
BM8 MULTI OPEN AND READ RANDOM	4.33	1.53
BM9 RANDOM READ IN RANDOM FILE	8.48	1.98
BM10 RANDOM WRITE IN RANDOM FILE	24.62	2.65
BM11 FRONT/END SWAP IN RANDOM FILE	368.06	65.18
BM12 CLOSE UP HOLES IN RANDOM FILE	33.66	18.26
BM13 CLOSE ALL DATA FILES	34.64	9.05
TIME IN SECONDS	663.97	163.70

* BBC computer fitted with 1.3 MB Solidisk 5.25" half height floppy disc drives, running Solidisk ADFS 2.1 (double density).
** BBC computer fitted with Solidisk XD20/40 Winchester (20MB), running Solidisk ADFS 2.1.
Now compare these figures with those published for leading business computers*:

COMPUTER		TIME	RANK
BBC with	20 MB**	164	1
FTS	20 MB	187	2
APRICOT XI	10 MB	192	3
SIRIUS	10 MB	203	4
IBM XT	10 MB	254	5

* Source: PCW September 1984.
** BBC computer fitted with Solidisk 20 MB, figure not published in PCW.

The BBC computer with Solidisk equipment is faster than the Fortune, the Apricot, the Sirius and up to 50% faster than the IBM PC-XT!!

At least until the new micros such as the ST520 or the AMIGA gain wide public acceptance (which may never happen), you can be quite sure that your BBC computer will remain the BEST computer around.

This is especially true for those who use the 6502, the Z80* and the 32016 Second Processors and ECONET.

Few have been able to discover the real strength of their BBC system, mostly because of the high price of Acorn Winchesters.
Now with Solidisk, price is no longer a barrier.

You can buy a 10 MB 'Minimum Configuration' at only £399.00 + VAT**. So, rather than waiting for Acorn to reduce their price, ring us today; we will despatch it to you by DATAPOST within 48 hours (credit card orders only).

* Z80 owners: CP/M BIOS 1.20 will run immediately on the Winchester because Solidisk DFS 2.1 has partitioning capability. This means that you can create 'drives' 4, 5, 6 etc. . . on the Winchester, and backing up your DFS floppy discs onto the Winchester.
Normally, a new MFM BIOS and new BOOT ROM are required.
(**) Minimum Configuration:
1) 10 MB drive, net formatted capacity.
2) Western Digital Hard Disc Controller.
3) Solidisk SASI interface.
4) Solidisk ADFS 2.1.
The minimum configuration is designed to work with all BBC Computers fitted with the later Switched Mode PSU (shiny) as on late issue 3, issue 4 and 7 machines alongside a single low power half height floppy disc drive such as the Mitsubishi in the SOlidisk Disc Offer, with or without a second processor and with or without the new style low power SWR64/128 board.
If you have any other add-on draining power directly from the computer's PSU, you must order the XD-10 or disconnect the floppy disc drive.
PLEASE NOTE: if you intend to use floppy disks with the ADFS, you must also purchase the Solidisk 1770 DFS interface or the 1770 + 8271 DFDC interface.
All Winchester drive offers contain some useful software such as database, wordprocessor and utilities. See full review in A&B Computing, September 85.
Solidisk also has one of the most efficient software support systems in the country; our engineers are experienced, enthusiast and helpful. Should you need assistance or advice, please do not hesitate to contact us and talk about it, we may be able to help since we may know of people using our Winchesters for programming, off loading mainframes, running Viewstore, running mail orders, medical practices etc. . .

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ADVANCED FILING

SOLIDISK 1770 DISC INTERFACE
For the BBC Computer

The Solidisk Double Density 1770 Disc Interface enables the standard BBC B computer to use most current types of disk drive. Only 4 components need to be fitted into existing sockets on the computer and this can be done in a few minutes by novice and expert alike. It now can run all Acornsoft games (such as Elite, Aviator, Revs, Magic Mushroom etc. . . .) and most other protected discs (Castles Quest, Island's Music System etc. . . .)

The Disk filing System provides every facility that you would expect such as built-in disc formatter and verifier, automatic 40/80 track switching, programmable disc speed and is upgradable to the Solidisk ADFS.

It also has some significant advantages over the Acorn 1770 system, mainly:

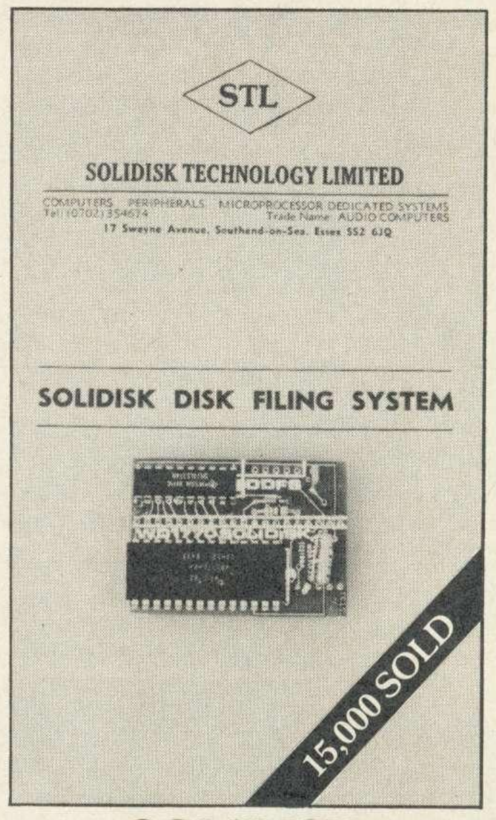
1) 60% more storage capacity in double density DFS, giving you up to 640k on a double sided 80 track diskette as opposed to only 400k bytes with the Acorn 1770.

2) Better emulation of the 8271: some protected discs (such as the early Acornsoft's Elite game) would not run on the Acorn 1770.

3) Built-in useful disk utilities such as TAPEDISC, MZAP, DZAP (disc sector editor), RECOVER, RESTORE etc. . . . which would add to cost if bought separately.

PRICE:

The 1770 Double Density Disc Interface costs £45.00 inclusive of VAT, DFS 2.0 ROM, manual and 1 year guarantee.
If you wish, you can also order it with the ADFS ROM and the total cost is £55.00 inclusive.



SOLIDISK ADVANCED DISC FILING SYSTEM
for the BBC Computer

The Advanced Disc filing System (ADFS) is now officially endorsed by Acorn and is certainly going to revolutionise software for the BBC Micro.
The Solidisk ADFS, reviewed in A&B Computing 85, whilst comparable to Acorn's ADFS, is very much designed with floppy disk and DFS software compatibility in mind.
The Solidisk ADFS will run most software available for the BBC computer, including all Acorn languages and the View family, Computer Concepts Wordwise and the INTER family, Gemini's Datagem etc. . . .
It also has PAGE at the lowest value, eg &1900 with one channel. It can realistically support up to 10 opened channels without slowing down the program as it does not swap buffer pages to disc.
It also has utilities such as *FORM, *VERIFY, *BACKUP etc not found in the Acorn ADFS ROM.
It is also very responsive and double safe, with automatic head settling and read after write automatic error correction.
It runs with all Acorn second processors including the latest 32016 mainframe machine (only Z80 CP/M requires new MFM BIOS) and it is fully supported by the Solidisk Toolkit ROM.
The Solidisk ADFS is available for the BBC B or PLUS fitted with the Solidisk 1770 Disc Interface or the Acorn 1770 as a TWO ROM chip set, consisting of the DFS 2.1 and the ADFS 2.1. A 32k ROM may be supplied in lieu of the 2 ROMs on request. It costs £20.00 when purchased separately like this.

SOLIDISK 1770 + 8271 Disc Interface
For the BBC Computer

As Acorn are now backing the Advanced Disc Filing System, many of you, having got the 8271 Disc Interface, wonder what you are going to do next.

If you get the Acorn 1770 upgrade, you will have to part with your 8271 and possibly a few expensive pieces of software such as the old Elite or Replica II which won't run without the 8271. It is still only a single density DFS.

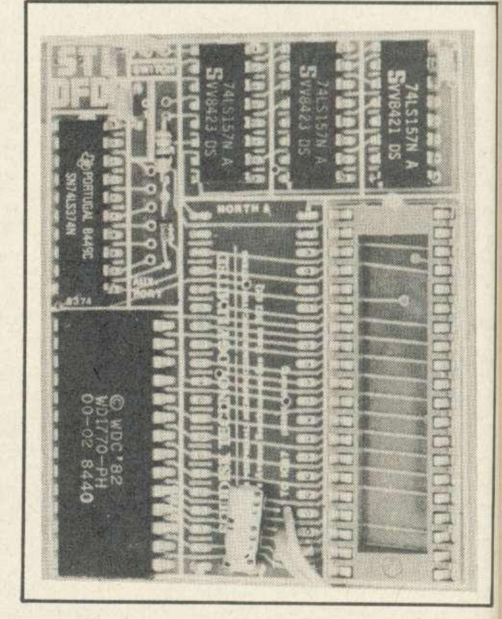
The alternative is to get the Solidisk 1770 + 8271 Disc Interface (known as the DFDC, acronym for Dual Floppy Disc Controller) which will let you keep the 8271 which you already have and add 1770 Double Density capability.

It is low cost, tiday and easy to fit.

At a flick of a switch, you can select either the 8271 or the 1770 Floppy Disc Controller.

You will have the best of both worlds: compatibility with the 8271 and fascination with the 1770 ADFS.

It is probably the fastest, more powerful and versatile Disc System for the BBC.
The DFDC costs £60.00 including VAT, manual, DFS 2.0 ROM and ADFS 2.1 ROM.



SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

SOLIDISK MITSUBISHI DISC OFFER

A Complete Disc System containing everything you need, including 1 Blank Diskette, at a new low price of only £200.00 inclusive.
The Misubishi Offer Comprises:
— One Mitsubishi MF4853, Double Sided, 80 Track Disc Drive. Cased in beige with all leads.
— One Solidisk DDFS complete Disc Upgrade with 2.0 ROM.
— One Verbatim MD525 Blank Diskette.
— One Software Pack and User Manuals.
— Full one year guarantee.
FREE: ADFS ROM!

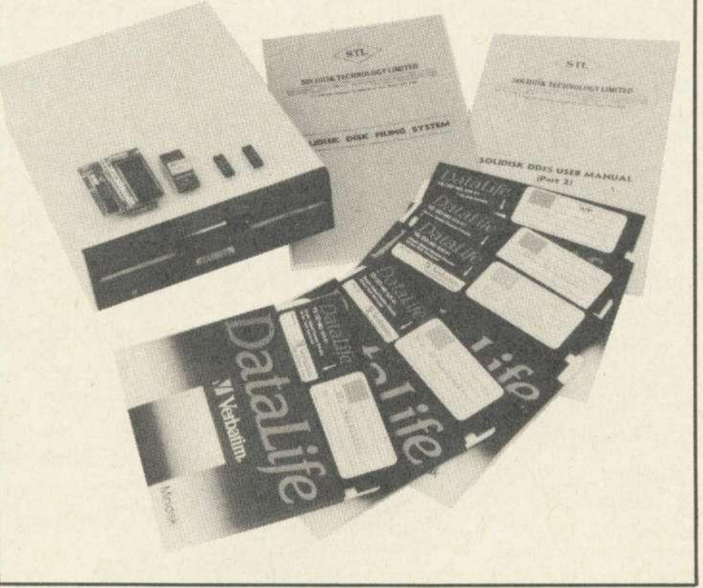
HARDWARE:

As described earlier as shown opposite.

THE SOFTWARE:

The software comprises 5 diskettes, formatted in 80 tracks.

Volume 1:
Solidisk Word Processor and Spelling checker with English dictionary. Easier than View, Wordwise or Scribe, you enter the WP by *WP filename, then start typing. What you see on the screen will be exactly printed on paper.
Most useful commands are all displayed on the top part of the screen.
It features 80 column screen throughout with direct on screen justification, automatic margins, page numbering, Wordstar like editing commands for block move, block delete, block copy, print, save, load text to cursor, insert and overwrite, search and replace, total word count, word frequency count, free space, *commands etc. Solidisk WP loads and saves texts in under 1 second flat and also you may save the edited version as many times and under any filename you like.
It has the unusual ability to spellcheck your document without leaving it, simply by typing in Control-U.
It has self dictionary generating capability too. You may create any dictionary you like by just simply entering the words.



Volume 2:
Volume 2 contains Solidisk Database. It is a random access system, completely menu driven and easily customised to suit any particular filing need.
It features unlimited filesize and number of records, supports all maths functions and 80 column screen throughout.
It is simple to understand and to use. You take one of the 15 different options to start. Each option will then lead to a new menu and so on. Mostly you only have to enter an appropriate data or hit the RETURN key.
You can design new databases, list all records, edit them, merge them, split them, making mailshot with Solidisk WP etc. . . We use it to process all your orders.

Volume 3:
Volume 3 contains Solidisk Spreadsheet. Menu driven with standard options to create, edit, recalculate, print, search, sort, report generator and mailmerge.
Unlimited number of rows and columns. Each column can be as small as 2 or as big as 70 characters. All math functions are supported. Complete with home banking and simple portfolio management.

Volume 4:
Volume 4 contains the Solidisk tape to disc program and a selection of computer games.

Volume 5:
Volume 5 contains MBASIC, SIGEN and other disc utilities.

IMPORTANT:

If you upgrade to a twin Mitsubishi disc system, Solidisk will offer you, subject to stock availability, a completely free set of CPU and keyboard case as shown earlier.

You should return your disc drive with payment for another Mitsubishi MF4853 (£160.00) or alternatively, save by ordering right now a Fantastic Offer at only £340.00.

The keyboard is 12 mm lower than the normal BBC case, 2-3 degrees more angled, weighs only 5lbs, does not skid about on the desk while enjoying 2 feet of freedom from the computer unit — and makes a lot of difference to typists (even 2 fingered ones!)

The CPU accommodates 2 disk drives and withstands any heavy weight monitor while providing easy attachment for the whole system, CPU and disk drives, to the desk if need be. Good ventilation to the power supply too and hides all untiday cables away.



PRICE

The complete CPU and keyboard case costs £30.00 inclusive + £3.00 post and packing. The system could be yours free as part of the Mitsubishi twin discs offer.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (16 lines).

SOLIDISK EFS COMBINES DISC
AND A SOCKET FOR THE W

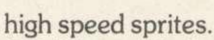
Solidisk Double Density DFS is now the ultimate in reliability and supported by the largest amount of software available for the Electron.
Solidisk relies on a good product and a large support network to win the heart of the user.
With over 75 Local Experts, covering England, Scotland and Wales, Solidisk can offer many users regional free fitting and advice.
With an ever increasing catalogue of free software, even users who are new to the Disc system can expect to build up a large library in a fairly short time.
Solidisk Software Support Service already has responsibility for over 50,000 BBC computer users and the ability to give you the best service matched only by the largest companies.
Solidisk Double Density DFS handles both BBC Discs and Electron Discs, in single and double density whereas the Acorn's PLUS 3 can only handle ADFS discs.
Solidisk ADFS has nice features such as automatic disc format sensing, built-in disc formatter and verifier and programmable disc speed.
It also has more than 20 disc utilities built into the ROM.
Standard features for both BBC DFS and ELECTRON ADFS implementations include:
1) Automatic Write Error Correction.
2) Automatic 40/80 track stepping, the ADFS 2.1 will let you read and write 40 trak discs if you have an 80 track drive.
3) Disc repair facilities.
Disc sector editor (*DZAP), memory editor (*MZAP), recover good sectors (*RECOVER) rewrite multiple sectors (*RESTORE), read bad sectors and bad track (*RTRACK), repair and restore bad sectors and track (*WTRACK) and the powerful disc copy (*DCOPY) which is capable of duplicating even some non BBC discs.
4) Wordprocessing facilities.
This facility allows *BOOT and other text files to be edited, saved and printed in any screen mode.
5) Automatic disc format sensing.
On Shift-Break, the STL ADFS 2.1 will detect the disc format and use the right BBC DFS or Electron ADFS to run.
On the Electron ADFS side, the 2.1 ROM also has some very nice features:
1) Extensive Disc formatting facilities.
*FORM40, *FORM80, *FORM160 and *WFORM (for the Winchester) are available to handle any disc drive.
2) Disc verifying facilities.
*VERIFIFY will check all disc sizes including Winchester for media defects.
3) Number of opened channels.

This is the star feature of Solidisk ADFS.
This facility (*OPEN) allows you to specify how many files will be opened in a program, thus maximising the available RAM while avoiding buffer page swapping as on the Acorn ADFS.
It leaves PAGE at &1900 for most programs, gives more room to View and Viewsheet and avoids unnecessary conversion work for many programs originated for the BBC DFS to be run on your Electron.

On the BBC DFS side, the STL ADFS 2.1 handles both single and double density and in addition, it supports:
1) Unlimited catalogue entries.
2) Unlimited filesize.

THE SOLIDISK 16k SIDEWAYS RAM:

Solidisk Sideways RAM is an almost indispensible add-on for the Electron with disc drives.
The Sideways RAM occupies the same memory area as the BASIC or ADFS ROM in the micro's memory map. This means that Sideways RAM can run almost any ROM type software, including languages, utilities and games.



Sideways RAM is notably invaluable to run games and specially "MEGAGAMES".
Games and programs run at 2MHz clock speed in Sideways RAM, if loaded into the Electron RAM, they can only run at 1MHz clock speed, ie half the speed of Sideways based games.
Megagames are too large to be run on the unexpanded Electron. They use extensively 8 colour high resolution screen (mode 2), background music, sound and high speed sprites.
Solidisk supply free software to maximise the use of Sideways RAM on the Electron. These include Wordprocessor, Spreadsheet, Database, Toolkit, Machine Code Monitor, Printer Buffer, Sprites, Playtunes, Virtual Memory Processor, VDU Replay, Screen Effects, digitised pictures etc . . .

THE WINCHESTER SOCKET:

Solidisk has the most powerful Winchester system for the BBC computers and the Electron. The Winchester system can provide from 20 Megabytes to a theoretically possible 1300 Gigabytes of storage, directly on line with the Electron.
The same Winchester unit can be used on the BBC B, the BBC PLUS and the Electron without any change.
You can read more about it in BBC Micro User or in Acorn User Magazines. Price of a 20 Megabytes system is only £700.00 + VAT (£805.00).

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

C UPGRADE, 16K SIDEWAYS RAM
NCHESTER FOR ONLY £59.00

SOLIDISK SPECIAL MITSUBISHI DISC OFFER:

This offer comprises:
- One 80 track Double Sided (640 kbytes) 3.5" Mitsubishi disc drive with its own PSU. Cased in beige.
- Solidisk EFS Disc Upgrade, 16K Sideways RAM and Winchester socket.
- One software package containing four 3.5" discs, detailed below.
- Full one year guarantee and 2 manuals.

PRICE: £200.00

You can also order as many Megagame Packs at the same time as you like. Each Megagame Pack consists of three 3.5" discs and contains on average 20 games.

THE SOFTWARE:

The software contains everything to start a library: the big four (Database, Wordprocessor, Spreadsheet and Graphic), Utilities and Games.

Database:

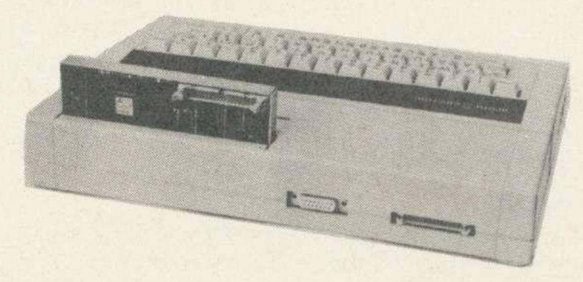
Solidisk Database is very easy to understand and use. You are presented with a 15 option Menu. Each option will lead to a new Menu and so on. Mode 3, 80 column screen is used throughout so that what you see is what will be printed on paper. With Solidisk Database, you can create as many records as you like, each record can be up to 15 fields of up to 60 characters. You can sort, search, index, mailmerge, append, create subset, calculate etc. Solidisk use the same Database to process all your orders.

Wordprocessor:

Solidisk Wordprocessor is WYSIWYG type (What You See Is What You Get) and has all the commands of a professional tool. It features 80 column screen, on screen justification, page numbering, search and replace, word count, free space, Wordstar like editing commands: insert and overwrite, block mark, move, copy, delete, save, load to cursor, * commands etc..

Spreadsheet:

Solidisk Spreadsheet is also Menu driven and has the same file structure as Solidisk Database. You can have as many rows and columns as you like, each column can be as small as two characters wide or as big as 70 characters. All maths functions are



supported. Recalculate, Replicate, Print, Print If, Sort, Search, Define Zone, Mailmerge, Text Input/Output etc . . . are included.

Toolkit:

Solidisk Toolkit is almost indispensible for Electron programmers, it has 24 star commands (Status, Rwipe, LVAR, Move, Search and Replace, Expand, Salvage, Keyload etc . . .).

ORDER FORM

PRICE LIST and ORDER FORM.	Price	P&P
Diskettes.		
Verbatim 3.5" box of 10	£40.00	£1.00
Software Pack	£10.00	£1.00
Solidisk EFS	£59.00	£1.00
Disc Offers.		
640k Mitsubishi MF453 Disc Outfit	£200.00	£3.00
1.3 MB Fantastic Offer	£310.00	£3.00
20 MB Winchester system	£805.00	£10.00
	Total =	

Name: ______________________

Address: ______________________

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Payment ☐ Cheque ☐ Cash or Postal Orders
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Access or Barclay Credit Card Account: ☐☐☐☐☐☐☐☐☐☐☐☐☐☐

You can also order by phone 0702-354 674 9AM-5.30PM

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SOLIDISK TECHNOLOGY LIMITED,
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We reserve the right to change specifications and prices for improvements.

SOLIDISK TECHNOLOGY LIMITED, 17 SWEYNE AVE, SOUTHEND-ON-SEA, ESSEX SS2 6JQ. TEL. SOUTHEND (0702) 354674 (10 lines).

ACORN COMPUTER SYSTEMS

BBC Model B	£299 (a)
BBC Model B + DFS	£346 (a)
BBC Model B + Econet	£335 (a)
BBC Model B + Econet + DFS	£399 (a)
BBC B PLUS	£409 (a)
BBC B PLUS 128K	£434 (a)
BBC Dust Cover	£4 (d)

UPGRADE KITS

Acorn DFS Kit............£80 (d) 1.2 OS ROM............£7.50 (d)
Econet Kit..................£55 (d) DNFS ROM............£17.50 (d)
BASIC II ROM with User Guide............£22.50 (d)
1770 Upgrade Kit for BBC B to B plus............£42.60 (d)
ADFS is Acorn's long awaited double density disc interface system. The hierarchical filing system on the ADFS allows almost unlimited number of files. Treating a double sided disc drive as one drive allows storage of much larger files and greatly enhances the storage efficiency. Will read 40T discs on 80T drives.
ADFS ROM (for upgraded B's and all B plus)............£25.20 (d)

ECONET ACCESSORIES

Econet Starter Kit.........£85 (b) Printer Server Rom......£41 (d)
File Server Level I.........£75 (d) 10 Station Lead set........£26 (c)
File Server Level II......£210 (d) Adv. Econet User Guide.£10 (d)

ACORN BITSTICK

The renowned 'BITSTICK' graphic CAD package. Using the on-screen menu and colour pallette, it can draw freehand as well as lines and shapes with great accuracy. Any part of a drawing may be magnified many times, and up to 48 drawings may be saved on a disc. In total, a friendly yet sophisticated CAD system offering tremendous value.
BITSTICK I £310 (a)
ROBOCOM BITSTICK II: This bitstick comes with Bitstick I software upgraded to allow for auto dimensioning, scaling £795 (a)
ACORN's multiplotter driver for Bitstick graphics £79 (c)
(All popular plotters included)
Epson FX80 screen dump routine for Bit Stick £35 (d)

ACORN WINCHESTER DRIVES

Acorn Hard Discs are now available in 10 and 30 Mbyte versions. The drive plugs into the 1 MHz bus. The ADFS filing system with its hierarchical filing structure provides excellent file management facilities. Data transfer rate of 1Mbit/sec and average seek time of 85 ms provides the user very fast access to very large amounts of data. File Server Level III can be installed on the Hard Disc before delivery.
10 Mbyte Winchester Drive £1299 (a)
30 Mbyte Winchester Drive £1999 (a)
Add £200 to the cost if File Server Level III is to be installed.

ACORN 2nd PROCESSORS

The Z80 2nd Processor converts your BBC into a CP/M business computer. Complete with comprehensive free software. £348 (a)

The 6502 2nd Processor provides both an increase in speed and memory. £175 (a)

ACORN P-SYSTEM

The long-awaited-for portable operating system has arrived. Intended for use with the 6502 Second processor, this portable operating system is a complete implementation and comes complete with a Filer, Editor, and compilers for two languages, USCD PASCAL and FORTRAN-77. Widely used in universities and colleges, as well as being popular with business software authors, P-System is user-friendly, offering ease of program development as well as portability. **P-System** £263 (b)

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Technical Information:
1200/75 Baud. Standard Viewdata/Prestel Protocols.
Please note that a 'Prestel' type terminal must be used.

EPROMs/RAMS

2764-25......£2.40 (d) 27128-25.....£3.20 (d)
6264LP-15..£4.50 (d)

TORCH PRODUCTS



GRADUATE: The ultimate upgrade — converts your BBC into a powerful 16-Bit business computer and makes it disc and hardware compatible with the IBM PC. With 256K RAM and dual drives, it simply connects through the 1 MHz bus. (The disc drives can be used in both BBC and IBM mode, without requiring a disc interface.) The top-of-the-range Model G800/2 comes complete with the free Xchange range of software, and includes a full feature word processor, a financial package — planner, a database and a business graphics all linkable.
(This highly acclaimed software is now available for the IBM PC at a cost of over £400!)

Graduate G800/2..................£845 (a)
(Offer valid for limited period only).

Z80 Card ZEP100 with PERFECT Software Packages + Z80 Basic..................£275 (a)
Z80 Disc Pack ZDP240 with software as above..............£550 (a)
20Mb Hard Disc + 1 × 400K Floppy Drive.....£1.950 (a)
Unicorn 68000, Unix OS/Z80B/512K, 20MB Hard Disc, 400K Floppy..............£3495 (a)

MULTI-FORM Z80 2nd PROCESSOR

This is a unique Z80 2nd processor running CP/M and allowing use of the massive range of CP/M software. What makes this unit rather special, is that it can be used with software from other CP/M computers, without the user needing specially configured software for the BBC. As supplied, the unit will read many formats and it is possible to configure the unit for virtually any other CP/M machine. Please contact us for further information.
Multi-form Z80 2nd Processor £325 (a)

ACORN MUSIC 500

Convert your BBC micro into a sophisticated music composition aid and sound effects generator. Custom made software will provide you with the flexibility to compose, experiment, perform and teach music. Stereo output can be connected to a sound system including your home stereo unit. Full specification on request.
Music 500 £174 (a)

SYMPHONY KEYBOARD

SYMPHONY KEYBOARD FROM ATPL — a professional 4 octave keyboard with sophisticated controlled software. Its multitude of facilities include simulation of musical instruments, sound effects, octave shift, pitch bend etc, etc. £108 (a)
Synth-500 disc allows its use with the Acorn Music 500 £10 (d)

TECHNOMATIC

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BBC Computer & Econet Referral Centre

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London NW10 1ED
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(close to Dollis Hill ⊖)

West End Branch
305 Edgware Road
London W2
Tel: 01-723 0233
(near Edgware Road ⊖)

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(c) £1.50
(d) £1.00.

PRINTERS

ALL PRINTERS HAVE A 12 MONTH GUARANTEE

EPSON DOT MATRIX PRINTERS: EPSON — the high quality range of dot-matrix printers that set the standard in the industry. A wide range of interfaces ensure that these top-of-the-range printers can be used with most computers.

RX 80T + **£210 (a)** RX 100 + **£345 (a)**
FX80 + **£315 (a)** FX100 + **£430 (a)**

Epson LX-80 NLQ: A new low-cost high performance dot matrix printer from Epson. Its many features include Near Leter Quality, Draft mode, programmable characters, a variety of print styles, graphics etc. Supplied with friction feed.

LX-80 **£219 (a)** Optional Tractor Feed **£20 (c)**

Epson JX80 ColourA full colour dot matrix printer with colour text and graphics as well as many advanced printer features.

JX80 Colour **£475 (a)**

KAGA NLQ PRINTERS
A top quality yet very competitively priced printer with a Near Letter Quality mode. Includes all the features of Epson FX and uses the same control codes. Extra socket provided on the pcb for installing either 8K RAM or 8K EPROM for custom made font.

KP810 (80 col) **£235 (a)** KP910 (156 col) **£339 (a)**

SEIKOSHA SP-10000
A low cost attractively packaged printer includes many novel features including NEAR LETTER QUALITY mode and automatic single sheet loading. Variety of fonts, 100 cps, friction as standard. Tractor optional.
Seikosha SP-1000 £189 (b)

BUFFALO 32K Buffer for EPSON PRINTERS

This compact 32K buffer can be fitted internally on any EPSON printer within a few minutes. It does not require external power or any modification to the printer. It will hold about 15 A4 pages of text freeing your computer for other jobs in a fraction of the time it would normally have to wait for the printer to finish all that printing. Supplied with full fitting instructions.
Buffalo 32K Buffer £75 (d)

DAISY WHEEL

BROTHER HR15: * 14 cps * 3K Buffer * Two colour printing * Proportional spacing * Underline * Bold * Shadow print * Super/Sub script + many other features.

BROTHER HR15 **£310 (a)**

JUKI 6100: * 15 cps * 2K Buffer * Switchable 10/12/15 cpi * Proportional printing * Linear Motor for max reliability.

JUKI 6100 **£299 (a)**

PERIPHERAL & COMPUTER SHARERS

We now offer an extended range of peripheral sharers to allow the user to switch between computers, printers and modems. High quality switching mechanisms housed in fully shielded metal cases ensure reliability. No external power input required.

All lines on the sharers are fully switched (36 on parallel and 25 on serial)

	Parallel	Serial
3 Computers to a Printer	36V36-3 **£69 (c)**	25V25-3 **£64 (c)**
4 Computers to a Printer	36V36-4 **£85 (c)**	25V25-4 **£74 (c)**
2 Computers/2 Printers x-over	36V36-X **£69 (c)**	25V25-X **£69 (c)**
BBC Cable Set 3 to 1 (1m ea.)	**£32 (c)**	**£34 (c)**
BBC Cable Set 4 to 1 (1m ea.)	**£39 (c)**	**£41 (c)**

Computer Sharer:
1 computer to 2 printers fitted with Cable for BBC TCS26 **£19.50 (c)**

GRAPHICS PLOTTER

Basic 3 colour flat bed plotter **£270 (a)**
Opto Sensor **£78 (d)** Drill Router **£79 (c)**
Basic Plotter can be powered from BBC psu
External 12V psu **£41 (c)** External 12V psu (for drill router) **£78 (c)**

BREAK-LOCK

A two-position key switch, fitting into the 'Ash-tray', that prevents accidental/unauthorised use of the Break key. **£8.50 (c)**

PRINTER ACCESSORIES

EPSON
FX80 plus sheet feeder **£129 (b)**; **LX80 sheet feeder £49 (b)**
Paper Roll Holder **£17 (d)** FX80 Tractor Attachment **£37 (c)**
Interfaces: 8143 RS232 **£28 (c)**; 8148 RS232 + 2K **£57 (c)**;
8132 Apple II **£60 (c)**; 8165 IEEE + Cable **£65 (c)**.
Serial & Parallel Interfaces with larger buffers available.
Ribbons: RX/FX/MX80 **£5.00 (d)**;
RX/FX/MX 100 **£10 (d)**; LX80 **£6 (d)**
Spare pens for H180 **£7.50/set (d)**

KAGA TAXAN: RS 232 Interface + 2K buffer **£78 (c)**;
Ribbon KP810/910 **£6 (d)**

JUKI: RS232 Interface **£65 (c)**; Spare Daisy Wheel **£14 (d)**;
Ribbon **£2.50 (d)**;
Sheet Feeder **£182 (a)** Tractor Feed Attach **£129 (a)**

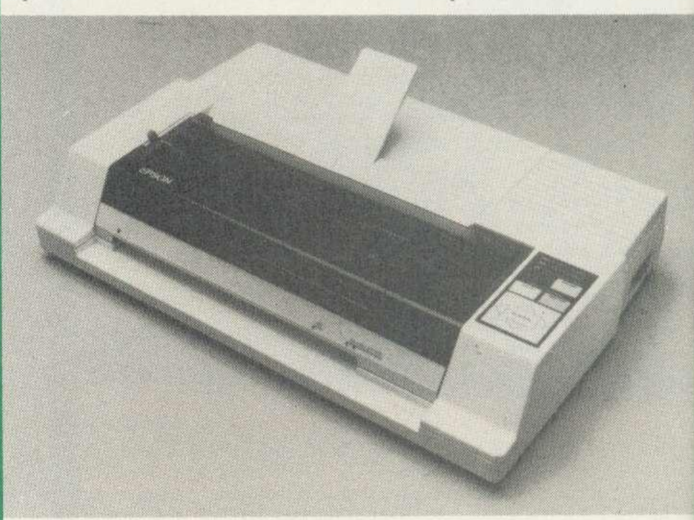
BROTHER HR15: Sheet Feeder **£189 (a)** Tractor Feed **£99 (a)**
Ribbons Carbon or Nylon **£4.50 (d)**; Red Correction Ribbon **£2 (d)**

BBC Printer Lead: Parallel (42") **£7 (d)**; Serial **£7 (d)**
Printer Leads can be supplied to any other length.

Plain Fanfold Paper with extra fine perforation (Clean Edge):
2000 Sheets 9.5" × 11" **£13 (b)** 2000 sheets 14.5" × 11" **£18.50 (b)**
Labels per 1000s: Single Row 3½" × 1 17/16" **£5.25 (d)**
Triple Row 2-7/16" × 1 7/16" **£5.00 (d)**

EPSON HI-80 PLOTTER

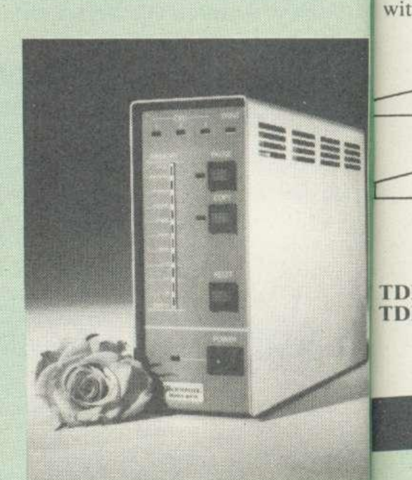
EPSON technology has once again scored a first by introducing a sophisticated A4 size plotter that does not need specialised software or programming skills to operate it and yet keep the cost within the reaches of all computer users. Features include 4 pens at a time — upto 10 colours to choose from, a variety of pen nibs, high speed plotting. Powerful software command codes include single commands to plot circles, ellipses or triangles. Line or bar graphs and pie charts can be plotted in a variety of exciting styles very simply by keying in the data into the computer. Detailed leaflet on request.
Epson Hi-80 Plotter £345 (a)



PRINTER SHARER/BUFFER

A unique sharer/buffer that provides a simple solution to improve system utilisation. It can be connected to up to three computers and it will automatically switch between the computers to scan for data — no manual switching required. High speed data input rate to the buffer cuts down the normal waiting time for the computers for the printing operation to complete and thus allowing the computers to be used for other uses. The 64K buffer would hold over 30 A4 pages of text.

Facilities include: COPY, PAUSE AND RESET. LED indication for percentage of memory available and data source. Mains powered. Send for detailed specification.



TSB 64 Buffer/Sharer **£199 (a)**
BBC Cable Set **£30**

MONITORS

All monitors supplied with BBC lead

MICROVITEC

All 14″ monitors now available in plastic or metal cases, please specify your requirement.

14″ RGB		**14″ RGB with PAL & Audio**	
1431 Std Res	£190 (a)	**1431** AP Std Res	£205 (a)
1451 Med Res	£240 (a)	**1451** AP Med Res	£280 (a)
1441 Hi Res	£389 (a)	These monitors can receive TV programs thru a Video Recorder	

Swivel Base for Plastic 14″ Microvitecs **£20 (c)**

20″ RGB with PAL & Audio

2030CS Std Res £380 (a) **2040CS** Hi Res £685 (a)

KAGA TAXAN 12″ RGB

VISION II Hi Res £240 (a) **VISION III** Plus £325 (a)

SUPERVISION III Plus £275 (a)

MITSUBISHI 14″ RGB Med RES IBM & BBC Compatible £229 (a)

SANYO CD3125NB 14″ RGB Std Res **£159 (a)**

MONOCHROME MONITORS:

SANYO DM8112CX Hi Res 12″ Green Screen	£95 (a)
KAGA KX1201G Hi Res 12″ Etched Green Screen	£99 (a)
KAGA KX1203A Hi Res 12″ Etched Amber screen	£105 (a)
PHILIPS BM7502 12″ Hi Res Green Screen	£75 (a)
PHILIPS BM7522 12″ Hi Res Amber Screen	£79 (a)
Swivel Base for Kaga Monochrome fitted with Digital Clock	£21 (c)
Monitor Plinth for the BBC	£13.50 (b)
Double Tier Plinth for BBC and flat pack dual drive	£19.50 (b)

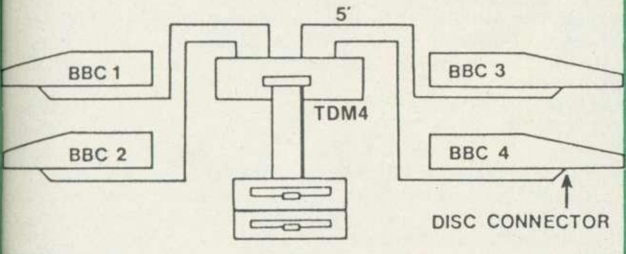
BBC Leads Kaga RGB £5(d) Microvitec £3.50 (d)
Monochrome £3.50 (d)

TOUCHTEC-501

Designed for use with Microvitec metal cased monitors, and using the RS-423 socket, this unit brings genuine touch-screen operation to your BBC. Ideal for the educational market. Supplied with a users handbook and utilities disc containing starter programs and development software. **Touchtec 501** £260 (b)

DISC DRIVE MULTIPLEXER

The cost-effective alternative to networking! A self-contained unit that enables up to four computers to be connected to one single or dual disc drive. No hardware modifications — simply plugs into the computers disc interface connectors. No ROMs or other software needed. All DFS commands work as normal. The switching of drives between computers is totally automatic and completely invisible to the user. This unit is ideal for installing in classrooms and other situations, where networking is not planned or necessary, or where costs must be kept low. In many cases software needs to be shared, although full networking complexity and cost is not needed. Several of these units can be connected in series to allow more computers to access the same discs, i.e. two quads connected together will allow 7 computers to share 1 drive. Units are supplied with 5′ of cable per outlet as standard. Mains powered.



TDM4 Quad Unit (up to 4 computers) £135 (a)
TDM2 Dual Unit (2 computers) £75 (b)

DISC ACCESSORIES

Single Disc Cable £6 (d) Dual Disc Cable £8.50 (d)

DISC STORAGE CASES

10 Disc Library Case £1.80 (d) 30 Disc Case £6.00 (c)

LOCKABLE CASES

40 Discs £14 (c) 70 Discs £15 (c) 113710 Discs £16 (c)

DISC DRIVES

TECHNOMATIC drives are fitted with high quality slimline Japanese mechanisms and represent the state of the art in drive technology. The drives are built to the highest standards and are tested to their full performance capability before packaging.

Single drives are available with or without integral mains power supply. The dual drive power supplies are switch mode type and are generously rated to ensure minimum heat generation even over long periods of operation. All drives with integral power supply are fitted with a mains indicator.

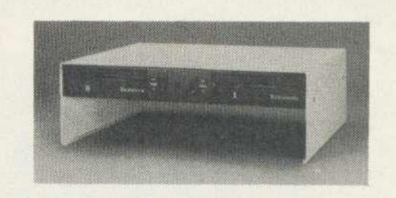
The drives are housed in attractively designed metal casings painted in hard wearing BBC matching paint. The dual drives can be supplied in stacked version or with built-in plinths. The plinth version cases are of sturdy construction to carry any monitor and provide a simple method of having a compact computer installation.

The 80T drives are supplied with the 40/80 track switching modules at no extra charge. The 40/80 track switches are conveniently positioned in the front on dual drives to enable easy switching between the tracks.

All drives are supplied with all the necessary cables, manual and a formatting disc. The mains powered drives are also fitted with a 13A mains plug suitably fused. The drives are ready to be fitted to the computer. All drives are capable of operating in single or double density modes.







Single Drives:

			With integral psu:	
1 × 100K 40T SS	: **TS100**	£79(b)	**PS100**	£99 (b)
1 × 400K 80/40T DS	: **TS400**	£85 (b)	**PS400**	£105 (b)

Dual Drives: (with integral psu)

Stacked Versions:		Plinth Versions:	
PD200 2 × 100K 40T SS	£190 (a)	**PD200P**	£205 (a)
PD800 2 × 400K 80/40T DS	£229 (a)	**PD800P**	£249 (a)

3.5″ Drives:
These compact drives, used with most of the new 16 bit micros offer fast access times and high performance with minimum of power consumption. The mechanisms are 80 track double sided and are capable of both single and double density operation. The single drive is offered in a dual case with a blanking plate for future upgrading. The drives come complete with cables, manual and formatting disc.

TS35 1 × 400K 80T DS £99 (b) **TD35** 2 × 400K 80T DS £175 (b)

Separate cased power supply £20 (c)

3M FLOPPY DISCS

Authorised Distributor
Data Recording Products



Industry standard high quality discs with guaranteed error free performance for life. Discs in packs of 10:

5¼″ DISCS

40 T SS DD £13 (d)	40 T DS DD £18 (d)
80 T SS DD £22 (d)	80 T DS DD £24 (d)

3½″ DISCS

80 T SS DD £30 (d)
80 T DS DD £38 (d)

DRIVEHEAD CLEANING KIT

The **FLOPPICLENE** drive head cleaning kit is an ideal way to ensure the optimum performance of your drives. The use of disposable cleaning discs eliminates the risk of contamination and abrasion of sensitive driveheads. These risks are normally inherent in the reusable drivehead cleaning kits.
Floppiclene with 20 disposable cleaning kits. £14.50 (b)

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(b) £2.50
(c) £1.50
(d) £1.00.

COMMUNICATIONS

MODEMS

BUZZ BOX This pocket sized BT approved modem complies with V21 300/300 baud and provides an ideal solution for communications between users, with mainframe computers and bulletin boards. Suitable for use with Open University computer. Battery/mains powered.
Buzz Box £60 (c) Mains Adaptor **£8 (d)** BBC Data Lead **£8 (d)**

MINOR MIRACLES WS2000 A world standard modem, having BT approval, covering V21, V23, (BELL 103/113/108 outside the UK) and including 75,300,600, 1200 Baud ratings. What possibly gives this modem its biggest advantage is its option of computer control. A 25Way RS232 input as well as possible computer controlled auto/dial/auto-answer makes this modem unique. **WS2000 £129 (c)** BBC Serial Cable **£7.**

WS2000 Auto-Dial card: includes an integral loudspeaker for monitoring of the phone line **£30 (d).**
BBC User Port cable (for modem control) **£4.**

SKI KIT (Allowing total control of the modem by your computer) **£10.**

DS1 Disc (for Commstar): When used with the Auto-dial card, SK1 Kit, and a user port cable, this software will dial out to Prestel, enter your password etc. and leave you in Commstar. Will also store many bulletin board telephone numbers and protocols for autodialling **£10.**

WS2000 Auto-Answer Card £30(d).
(Please note that the A/D & A/A Cards are still awaiting BABT Approval.)

DATA-BEEB An advanced communication ROM from Miracle Technology. Its many features include both Viewdata (Prestel) and Terminal modes, Auto-Answer and Auto-dial for fully expanded WS 2000's etc. Macro facilities allow flexible use of its many facilities e.g. automatic dialling, log-on, going to a specific page, printing it, and going off-line, all in one operation. **£25 (d)**

NEW WS-3000 RANGE — the new professional series. All are intelligent and 'Hayes' compatible, allowing simply 'English' commands to control its many features. All models feature Auto-Dial with 10 number memory, Auto-Answer, Speed Buffering, printer port, data security option etc. All models are factory upgradeable.

WS3000 V2123 (V21 & V23 + Bell) **£295 (a)**

WS3000 V22 (as above plus 1200 baud full duplex) **£495 (a)**

WS3000 V22bis (as above plus 2400 baud full duplex) **£650 (a)**

The WS3000 range all have BT approval.

COMMSTAR An ideal communications Rom. Extremely easy to use, yet very versatile. It features both a Prestel mode as well as a Terminal mode, thus offering very good value for money. In Prestel mode, all normal Prestel features are available including, downloading of software, saving and retrieving of pages on disc, page tag, revealing of hidden text etc. Its terminal mode is ideal for bulletin boards etc. Any type of file, (not just ASCII) may be sent using XModem protocols. Even includes an elapsed time clock. **£27 (d)**

TERMULATOR Acorn's Communication Rom. **£29 (b)**

COMMUNICATOR This is a full 80 col VT100 terminal emulation program on 16K eprom. It is a more advanced program than TERMI and features easy to follow screen menus. The rate at which data is sent or received is easily set up with rates up to 19200 Baud with 80 column text. Allows files to be transmitted from disc, or a copy of incoming data to be sent to a file or to a printer. (Communicator is not suitable for PRESTEL). **£57 (d)**

REAL-TIME CLOCK CALENDER

A low cost unit, allowing the facilities of units costing far more. Built to professional standards, it opens up the total spectrum of Real-Time applications. Possibilities include desk diary/planner, calender, continuous display of on-screen time and date information, automatic document dating, precise timing and control in scientific applications — its uses are endless. Simply plugs into the user port — battery backup is supplied as standard. A full manual as well as extensive software including a simple demonstration diary/planner application program on cassette (easily transferred to disc) — no ROMs needed. **£29 (c)**



EPROMER II



A sophisticated eprom programmer that handles the full range of popular single rail eproms (incl 27256) and allows the user full control of the programming process.
Its powerful menu driven software makes the programming of eproms simple, efficient and eliminates the need to have fiddly switches for selecting eprom types, programming voltage or method. The features include:

* Integral power supply ensures no power drain from the computer.
* Interfaces through 1 MHz bus, fully buffered.
* Clear and simple instructions displayed on the screen make the programming easy for both the first time user and the advanced user.
* Eproms upto 16K (27128) programmed in single pass.
* Selectable programming voltage 25/21/12.5V
* Selectable programming method — normal or high speed algorithmic. High speed programming enables 27128 to be programmed in just over 2 mins. Normal programming skips addresses with FF data to increase programming speed. Automatic verification on completion of programming.
* User can select any section of the eprom from a single byte to its full address range to Blank Check/Read/Program/Verify enabling program development/changes very simple.
* Full screen editor with HEX/ASCII input.
* Full tape/disc filing facility. Data input from keyboard/Tape/Disc/Eprom.
* Constant display of all options selected.
* Several BBC BASIC programs can be entered on a single eprom.
* Checksum facility allows for easy identification of programmed roms.

EPROMER II with Manual & Software on disc **£99 (b)**
ROM based software **£10**

UV ERASERS

UV1T Eraser with built-in timer and mains indicator. Built-in safety interlock to avoid accidental exposure to the harmful UV rays. It can handle up to 5 eproms at a time with an average erasing time of about 20 mins. **£59 (b)**

UV1B as above but without the timer. **£47 (b)**

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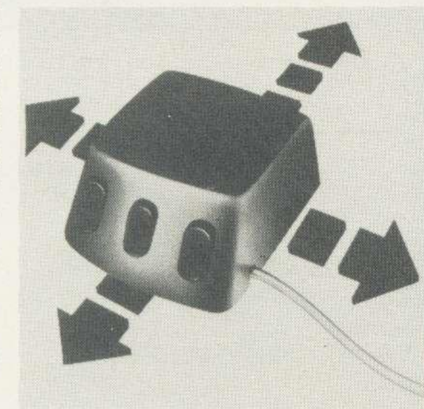
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LANGUAGES



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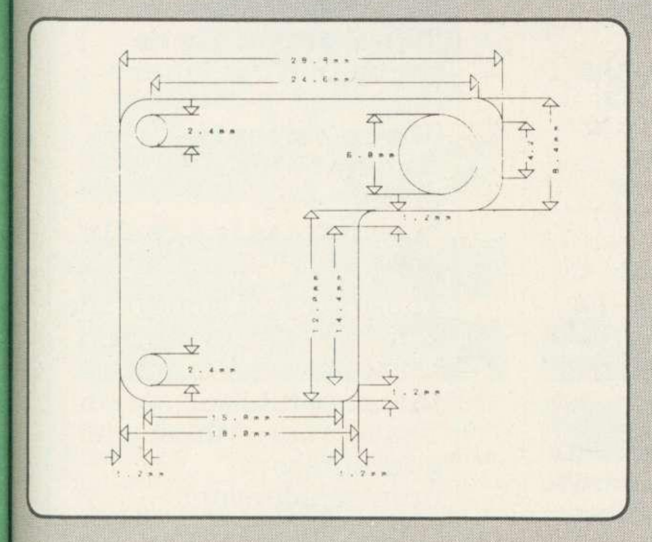
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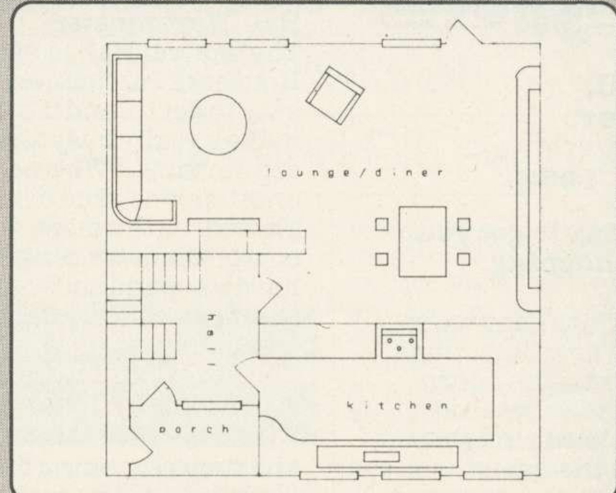
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All you need is a BBC micro model B fitted with Acorn DFs and a single disc drive. If you have a 6502 2nd processor and a dual disc drive then NOVACAD's capabilities are further enhanced.

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* Text can be added at any position vertically or horizontally.
* Use of 2nd processor will allow use of 4 colours, higher pixel density drawings and considerably faster operation. (NOVACAD without the 2nd processor if faster than any other CAD package we have seen for the BBC).
* Powerful delete facilities allow deletion of single lines or whole sections with minimum of key presses.
* Printer dump for Epson compatible printers incorporated in the software which allows a full or a sectional screen dump.
* An optional plotter utility will allow output to a range of popular plotters for high quality diagrams.

NOVACAD will prove to be an invaluable teaching aid in technical schools and colleges and for anyone involved in draughting it will be an ideal labour saving tool.

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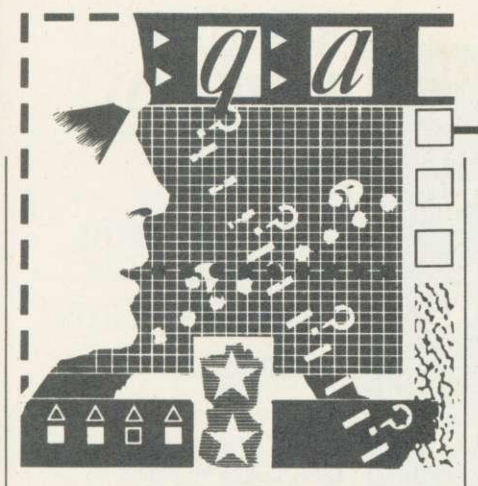
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Martin Phillips gives tips on producing double height and width characters, and looks at keyboard links and DIL switches

Why a printer driver?

SEVERAL of the letters expressing difficulty about getting into the *View* word-processor have mentioned printer drivers. I am not going to give a detailed account of how they work – I shall leave that to the printer expert, George Hill (see June 1985 for his *View* printer driver generator) – but simply explain what a printer driver is and why one is needed.

Printers are quite difficult things to use. This is due to the versatility of the printer, the rather poor quality of some printer manuals, and examples in the manuals being written in Microsoft Basic and not BBC Basic.

To include commands like underlining, *Wordwise* uses a technique whereby the actual codes to be sent to a printer are embedded in the text (embedded commands). These are quite easy to use, except that you need a list of the common codes handy, and they have to be entered every time a printer effect is desired, which can get very tedious (yes, I do know there are ways of not having to enter the codes every time).

View uses a different system, called highlights. When a highlight is included in the text, the program jumps to a part of memory where the highlight codes are defined and then sends the codes to a printer. Here lies the problem. For instance, on most dot-matrix printers, code 15 gives condensed print mode, yet on some daisywheel printers this is the code to start underlining. The default highlights in *View* are underlining and bold printing: that is, for a dot-matrix printer. It's hard luck if you are using a daisywheel because the wrong codes are sent.

However, this is where printer drivers come in. These are codes for different printers, saved on disc or cassette, which can be loaded in instead of the default printer driver set up by *View*. You can then use the right codes for a particular printer. The Acornsoft printer driver offers drivers for five different printers and George Hill's can be tailored to suit any printer.

Choosing a DFS

J HORSNELL from London wants to buy a disc drive for his BBC and asks which interface (or disc filing system) I recommend, which double-density board is the most compatible, and if there are any PHROMs to expand the Acorn speech system.

To take these in turn, my advice (and it is just my own opinion) is that the Acorn DFS is perhaps the best one to buy. I say perhaps because this subject is a minefield – I wish I could give a simple answer! Many programs are heavily protected and will not work with some of the other DFSs. Much as I like the Watford DFS with its 40/80 track option, its disc sector editor that has got me out of trouble so often and its built-in formatter, I am finding an increasing number of programs will not run on it. It's not that the Watford DFS is not very good, but that some software producers are doing rather naughty things with their programs.

That said, the publishers of these programs are coming rather unstuck because these programs will not run on the latest Acorn DFS (1.2) or on the BBC B+ which has a different disc controller and DFS. The problem here is that you have a reasonable protection if a program is advertised for the BBC yet doesn't work on both Acorn DFSs. Obviously you have less comeback when using other makes unless the documentation makes it clear that it will work on that DFS.

The same goes for double density boards. Watford, for instance, claim that their DDFS has an 8271 emulator so it can run protected software – it is probable that this DDFS will run some software that will not run on a BBC B+! My advice, therefore, especially for those who wish to store as much as possible on one disc, is to buy a switchable 80-track drive, and to stick to single density. The switchable drive should cause no problems when reading 40- or 80-track discs, the only disadvantage being that it won't reformat a disc that has been formatted on a 40-track drive (it will, of course, reformat a 40-track disc that has been formatted on a switchable drive). Again, this is a simplistic overview.

To answer Mr Horsnell's last question: there are other PHROMs for the Acorn speech system, but not Acorn ones. Texas Instruments, who make the speech system for Acorn, market a range of their own PHROMs which should work instead of the Kenneth Kendall one. However, they all speak with an American accent, and generally are concerned with a particular use, eg, there is one PHROM that could be used for instrumentation; apart from the range of numbers, it can say words like 'volt' or 'amp'. There are several military versions, with vocabularies covering things like the weather. Getting hold of these PHROMs might be difficult, though. Acorn has not yet produced a carrier (to plug into the 'ashtray' at the side of the keyboard) to take these extra PHROMs, and in any case, some of them have the same PHROM number as the Acorn PHROM.

The best way to expand the vocabulary for the Acorn speech system is to get hold of the new Computer Concepts' Speech ROM. I am reviewing some of the more useful speech systems for a forthcoming *Acorn User* so I won't say much here except that first impressions are that it is an excellent ROM with an almost infinite vocabulary and high quality speech.

Front ends made simple

THE current software trend is to have attractively coloured front pages as well as windows for displaying information. It looks very difficult to achieve, but is very simple to program.

First, a grid of dots is placed on the screen to provide it with a textured effect. A window is then defined and the screen cleared (several windows can,



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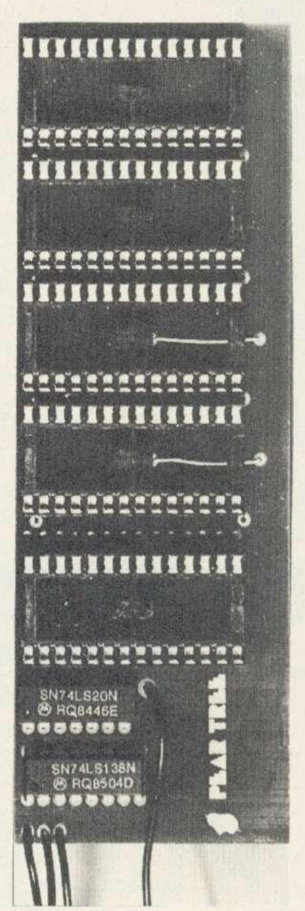
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of course, be defined using different areas of the screen). Listing 1 shows the technique. The program runs in mode 1, though as only two colours have been used, any of the graphics modes could have been chosen. The dots can be placed on the screen using the PLOT command that draws a dotted line – PLOT 29. The vertical scale on the

```
 10 REM Listing 1
 20 REM by Martin Phillips
 30 REM for BBC B/B+ and Electron
 40 REM (c) Acorn User November 1985
 50 :
 60 MODE 1
 70 FOR Y%=0 TO 1023 STEP 8
 80 MOVE 0,Y%
 90 PLOT 29,1279,Y%
100 NEXT Y%
110 VDU 28,6,18,34,4
120 CLS
```

Listing 1. Sets up texture, defines a window and clears the screen

BBC goes from 0 to 1023 in steps of 4, so to print every alternate line, the step size is set at 8. This will produce the texture on the screen.

Next, a text window is defined (line 110), and the window cleared to leave a black rectangle. It can be made to look even more effective if, after the window

```
 10 REM Listing 2
 20 REM by Martin Phillips
 30 REM for BBC B/B+ and Electron
 40 REM (c) Acorn User November 1985
 50 :
 60 MODE 1
 70 FOR Y%=0 TO 1023 STEP 8
 80 MOVE 0,Y%
 90 PLOT 29,1279,Y%
100 NEXT Y%
110 VDU 28,6,18,34,4
120 CLS
130 VDU 28,7,17,35,3
140 COLOUR 131
150 COLOUR 0
160 CLS
```

Listing 2. The text window is moved across one space to produce a shadow effect

has been cleared, it is moved across one space and cleared in white – it produces a shadow effect, simple but pleasing. Listing 2 shows how this can be done. Once the second window has been defined, line 140 changes the background colour to white, and line 150 changes the foreground colour to black. Then the new window is cleared.

While only black and white have been used here, many other colour combinations could be tried. Only one window has been used, but several could be placed on the screen – the possibilities are endless.

£5 Double your width and height

SOME time ago a routine to print double height text appeared in Hints and Tips. For those of you who might have missed it, I'm including it again (listing 3 in the yellow pages). It will work in any of the BBC's or Electron's graphics modes and gives double height text. It's a fairly simple routine that looks at the character definition stored in memory, and then redefines the character so that each line of the character definition is printed as two lines. To do the same thing to produce double width characters is more difficult because each bit of the character definition has to be split up and printed out twice. The diagrams below show what has to be done.

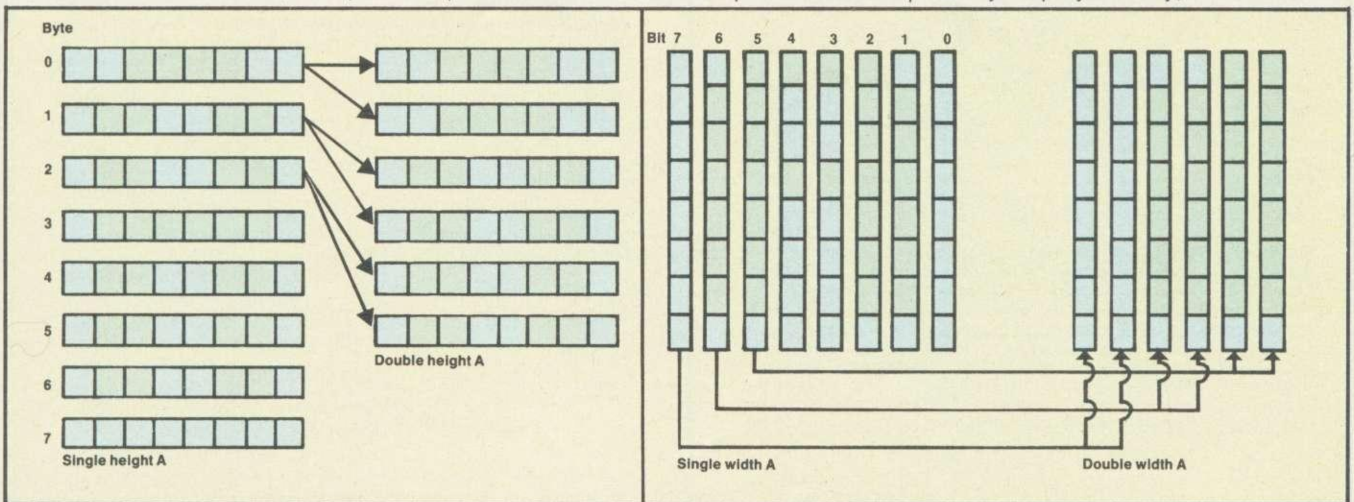
Phil Hardcastle earns himself £5 by sending in a very useful routine to not only print in double height but also to print in double width. It has a machine-code element to handle the more complex manipulation of splitting up each line of the character definition and will work in any of the graphics modes. Listing 4 shows how it's done; the demonstration works in mode 0. The resulting text is the same as using the first double height routine in mode 1.

The DEFPROCdouble procedure can be altered quite easily to just give double width text. A double width version of DEFPROCdouble is also included on the yellow pages (listing 4a) to show how it's achieved. Redundant lines from the old DEFPROCdouble have been replaced by a line with a colon, and can be left out altogether. This, too, is a most useful routine. The text produced in mode 0 is the mode 1 character set, so it would be possible to have a drawing program that had mode 0 resolution for drawing lines, but gave mode 1 sized text. Similarly, in mode 1 the text is the same size as normal mode 2 text.

Update on Sphinx hint

IN June's Hints and Tips there was a tip for running *Sphinx Adventure* on the Electron. David Greenwood from Luxembourg has modified this idea to work on the BBC. David points out that the method, as published, suffers from a drawback: most of the screen is filled with rubbish generated by the Basic stack. It is possible to get a very good display on the BBC by reprogramming the 6845 CRTC registers. His routine is listing 5 on page 53. It won't, unfortunately, work on the Electron because that doesn't have a 6845 CRTC chip.

It's best to start in mode 4, otherwise 192 bytes are lost at the end of the mode 6 memory map. In the example, lines 140 and 150 set the screen start address to the top of the window, then line 160 displays the number of rows in the window. This blanks out all the unwanted bytes. Line 170 brings further improvement: it double spaces the display by defining the character height to be 16 scan lines instead of eight. Lines 180-190 set up the sync signals to give a steady display. Finally, *TV moves the



The left-hand diagram shows how to produce double height characters: the right shows how bits are split to give double width

whole display down a few lines. Setting the number of lines to 16 gives a 5k text mode that includes user-definable characters, something that is not available in mode 7. Graphics can be used if the double line spacing is not used. To understand what's been done, once listing 5 has run change the screen colour to blue using the following VDU statement:

VDU19,0,4,0,0,0

Now you can clearly see the double line spacing.

Keyboard links explained

ON the right-hand side of the keyboard PCB are two parallel rows of eight holes. Each pair of opposite holes is one of the keyboard links. An 8-way dual-in-line (DIL) socket can be soldered into position to make or break the links, or the appropriate links can be made by soldering tinned copper wires in position. On the old-style keyboards, the switches are in a horizontal bank and on the newer keyboards, the bank is vertical. The horizontal bank is read from left to right, the vertical bank is read from bottom to top. The DIL switches can be obtained quite easily from electronics shops, or a dealer should be able to fit one.

What do these switches do? Switch 1 is used by the DNFS (the combined disc and Econet filing system). If switch 1 is off (no link made) then the machine will start up in DFS; if the switch on (the link is made), the machine will start up in the network filing system. Switch 2 is not used.

Switches 3 and 4 are very important for disc users. These switches control the disc drive step, settle, and head load times. By adjusting these to suit the make of disc drive, considerable speed savings can be made, especially when using random-access files. Also, that annoying clicking can be reduced. Before these switches are set it is important to find out the make of disc drive as most suppliers do not actually make and fit their own, they buy in the drives, put them in a case and add leads and sometimes a power supply. Therefore, to find out what make of drive you actually have it is necessary to find the disc protection sheet if one was fitted when the drive was bought – the disc drive name is usually on this. Otherwise, you'll have to unplug the disc drive (from both the computer and the mains), remove the cover and look for the make on the chassis. The main makes are Canon, Teac, Shugart, Mitsubishi, Olivetti, Tec and Epson. Most disc drive manuals now give the switch settings for the various drives. Generally, links 3 and 4 both off refer to the older full-height drives, 3 on and 4 off are for 40-track half-height drives, 3 and 4 on are for 80-track drives, and 4 on and 3 off are for switchable drives. These should only be seen as a rough guide, so do check the relevant disc drive manual.

Link 5 will reverse the Shift-Break function so that simply pressing Break will auto-boot the disc.

Links 6, 7 and 8 are used to set the start-up mode at switch on. If using, say, *View* all the time, you could set these links so that at switch on the computer was in mode 3.

See listings 3, 4 and 4a on yellow page 105

```
   10 REM Listing 5
   20 REM by David Greenwood
   30 REM for BBC B/B+
   40 REM (c) Acorn User November 1985
   50 :
   60 *TV 253
   70 MODE 4
   80 N%=8:REM Number of lines (maximum of 16)
   90 VDU 28,0,31,39,32-N%:REM Set up text window
  100 HIMEM=&8000-N%*320
  110 start=HIMEM DIV 8:REM Address of top left
corner of screen DIV 8
  120 :
  130 REM Alter contents of 6845 CRTC registers:
  140 VDU 23;12,start DIV 256;0;0;0:REM Displayed
screen start address (high)
  150 VDU 23;13,start MOD 256;0;0;0:REM Displayed
screen start address (low)
  160 VDU 23;6,N%;0;0;0:REM Number of displayed
character rows
  170 VDU 23;9,15;0;0;0:REM Number of scan lines
per individual character
  180 VDU 23;4,19;0;0;0:REM Number of character
lines minus one
  190 VDU 23;7,17;0;0;0:REM Vertical sync
```

Listing 5. Creating a memory-minimising mode

Quickfire questions

K NICHOLLS from Dapto in Australia has a map-drawing program that produces odd, coloured dots in the corner of the screen. He says that he has altered the value of HIMEM to get the program to fit. His problem is, in altering HIMEM, he has inadvertantly put the program's variable storage space into a part of the screen memory that is used for the screen display – when a variable is used, it appears as a dot on the screen.

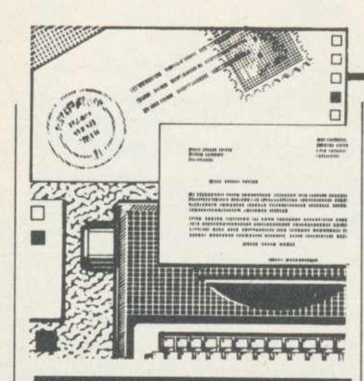
TIM BONE from Oxford asks how to list a games program written in Basic so that the "Bad Program" error message does not appear.

The answer is to not chain the program and then press Break, but to load the program instead. Then, don't run the program, but just list it in the normal way.

R COOKE has a ROM extension board to which he has fitted 16k RAM in socket 15. He wants to know how to store and retrieve information from it. To put information into this RAM, simply *LOAD the information in, starting at memory location 8000. Then to save it, use *SAVE. When stored in this RAM area, programs will not be destroyed by pressing Break.

R BHANAP wants to protect discs so that data files on them can only be read by those authorised. As a rough guide, any protection must be better than the abilities of the people using the system, and their desire to see or use other files – for example, if such protection is solely to prevent curious casual viewing then a simple system is possible; if the files are of a sensitive nature, then protection is very difficult. An example I heard of recently was a major bank who had written a computer program to let schoolchildren handle their own accounts in school. Here the security of the file is most important, yet the data could easily be changed using a disc sector editor.

An easy way to protect files (that fools many people) is to prevent the files being catalogued. You can do this using a disc sector editor, and editing the disc title so that it contains codes to switch off the screen and the printer. Changing track 0 sector 0 bytes 0 and 1 to read &15 and &3 will do this.



Shouting about the model C

Sir, Over the past few months we have seen the new microcomputers which will shortly cause the death of the BBC model B. Although the Beeb will still be perfectly useable as a home computer, the software houses and enthusiasts (myself included) will concentrate on the new generation micros. Anybody who uses a computer expects more and more from it until the software he is using becomes limited by his hardware, so it's natural to want to move on to bigger and better things – witness the demise of the Atom when the BBC B was introduced.

Consequently, I am more concerned over the possible still-birth of the BBC model C than the death of the model B! The new micro will (hopefully) be a member of the new generation and will have to compete with the likes of the Atari 520ST and the Amiga. It will thus have to offer built-in mass-storage, a 16/32 bit CPU and a trendy mouse/icons/windows operating system to be successful. Acorn's recent financial troubles and the rumours of staff leaving the BBC C development project force me to wonder whether Acorn can possibly produce a competitive machine.

Acorn's fondness of the little-used 32016 CPU may put the model C at an immediate disadvantage if it is used, since it will place Acorn apart from the mainstream of 68000-based machines. When Acorn built the BBC B it chose a well-established processor and it had the innovative ideas of the BBC behind it. It produced a machine which, although expensive, was seen to be an impressive advance in micros at the time.

Unfortunately, Acorn will not be first with a powerful 16/32 bit home micro. At the time of writing two other manufacturers have a headstart with very impressive, advanced machines, so the BBC C will have to provide them with some serious competition if it's to prove successful.

So drop the secrecy Acorn – if you think you've got a machine worth shouting about, tell us all about it before we buy something else!

Phil Martin
Cornwall

Golden promises unfulfilled

Sir, Telecom Gold holds out a golden promise of rapid, easy communication both intercompany and internationally, plus the extra 'lollipop' of a telex facility. Promises are often unfulfilled, and Telecom's are no exception.

My experience of Telecom Gold has been hallmarked throughout by intense frustration and failure; I have therefore plenty of dealings with what it calls its help-line – now there's a misnomer!

Perhaps your readers, being an intelligent crowd, better versed in 'computerese' than I, would have had less difficulty in understanding the instruction books. No doubt they would have been better able to decipher the gobbledegook that fills the screen when one uses the Tutor facility.

However, the major drawbacks to the system, in my experience, are these: the frequent and extreme difficulty of access to the system and the unreliability of the computer.

In other words, if you manage to get through it would often have been quicker, simpler and cheaper to have written a letter.

Appeals to Gold's management for assistance have so far met only with lofty platitudes and evident disinterest – it seems one has to be ICI to be worth worrying about.

J H Cambridge
Merseyside

ASK a silly question, pass a fair comment, stage an angry protest – we don't mind what you write to us about (or about us!). Keep 'em short, keep 'em sweet, but keep 'em coming! The address is: Letters, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

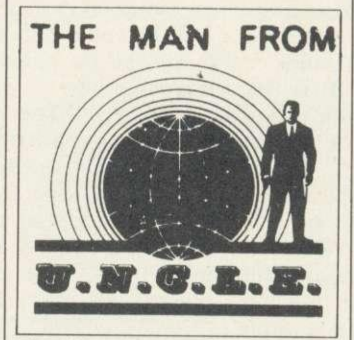
Is it the silly season?

Sir, It does seem a pity, not to mention annoying, when one gets the distinct impression that you lot in there don't really care much about us lot out here buying your magazine.

Take for example, page 39 in the May issue, and the 'Break key' item. There is an extremely detailed (rather silly?) diagram about making a piece of cardboard suitable to surround the Break key. However, when one reads about being able to disable this key and install an alternative at the back of the machine, not even a hint is given as to the correct spot to connect the new switch.

Flick back to page 17 and the briefest of items about ASA complaints. Are you so afraid of losing valuable advertising revenue that you daren't inform your readers of exactly what the ASA objected to?

Over the page to number 15. Despite the (slightly?) misleading heading 'Add discs to Electron' a major piece of very important news is buried in the item. It's the QFS.



The 'Man from Uncle' column: 'purely for mindless tiny tots'

Yet, no actual mention is made of the number of files which can be created on one side of the disc. Surely you could have given Guildford a ring? However, idle speculation about 8271 replacements fills up the article. Surely hard facts ensure your readers stay informed?

The extremely childish back page and the 'Man from Uncle' column suggest that your magazine is designed purely for mindless tiny tots.

However, giving credit where its due, the business pages were very good and even if one doesn't use the Z80, one must acknowledge the usefulness of these.

Paul Janik
Slough

Lisp news

Sir, Would any Lisp-speaking readers be interested in forming a correspondence circle devoted to this computer language? I am sure that users of all levels of expertise would benefit from an interchange of ideas and I envisage the production of a newsletter two or three times a year.

Write to me at 294a Caledonian Road, London N1 1BA.

John Wellsman
London

Holes in the network

Sir, I can tell Joe Arrowsmith (Letters, September) exactly why there is so little software written specifically for Econet. I recently completed a 55k A and O level Statistics package which has been launched by a well known software house. I tried to make it suitable for Econet but ran into two problems.

First, no competent programmer would complete a package designed for Econet without testing it thoroughly on the various systems. I contacted many people, I advertised on Micronet, and eventually phoned a resources group in Surrey. It said it might be able to help me get access to a system, but needed a letter of introduction from my software company!

It also saw difficulty in arranging for a school to give up its Econet system for a few hours, and when they discovered that my package would be sold commercially, made it clear that it did not really approve. (As if I would be prepared to spend 800 hours on a package without the prospect of a few hundred pounds in royalties!)

Second, although Acorn was helpful, it became clear that probably none of the several Econet systems would be able to run my package (it uses data files and a custom screen dump, all quite normal). I therefore decided not to pursue Econet further.

Until someone out there makes it easier for programmers to use all the Econet systems, and Econet is made more flexible, Mr Arrowsmith will continue to be disappointed.

N S Kirkby
Surrey

Easy Driver comes to Electron user's aid

Sir, George Hill's printer driver generator (*Acorn User*, June) came at an uncannily opportune time. I had just purchased an Acorn/Olivetti JP101 ink jet printer and had discovered that using my Electron and Plus 1 with Acornsoft's *View* wordprocessor I was unable to access any of the alternative character features or highlights offered by this interesting, budget-priced printer.

I carefully typed in the listing, created my 'JP101' printer driver, and then puzzled over how to use it.

The problem was partly due to my lack of knowledge of the BBC B version of *View* – George's article makes no allowances for Electron users.

However, July's Blunderbox provided sufficient information to work out how to use the utility. Overjoyed, I typed in some trial text using the appropriate codes, and tried to print.

Some features appeared to work correctly but others failed to initiate when the control code was given, or operated only after the cancellation code was sent, remaining in action throughout the rest of the document!

After much experiment I found that all the codes would produce the expected effects if used in isolation, but odd effects could occur if more than one code was employed.

If there are any other JP101 owners having problems, the following observations may be of some help.

Wherever in a line the double height character feature is initiated, the whole line becomes double height, and the reset command to return to single height must be placed at the start of the next line or it will not be effective. This means, that you cannot use single and double height characters on the same line.

Single and double underlining cannot be mixed on the same line. Whichever of the two is selected last in any line will appear whenever either is called. Dotted underlining can be used in the same line with either of the other two but will be double when double-underline is the dominant selection.

Most of my initial problems seem to have resulted from incorrect positioning of the reset command from double height printing. If this is placed on the same print line as the initiating command, not only does it fail to operate, it also interacts with any subsequent highlight command, producing unexpected print features.

Andy Dear
Clackmannanshire

```
THIS IS TEXT WRITTEN IN STANDARD CHARACTERS (10 PER INCH
THIS ROW OF CHARACTERS IS UNDERLINED
THIS ROW HAS DOUBLE UNDERLINING
NOW THE UNDERLINING IS IN DASHES
THESE CHARACTERS ARE SMALLER (12 PER INCH)
AND THESE ARE SMALLER STILL (18 PER INCH)
THESE ARE DOUBLE WIDTH
THESE CHARACTERS ARE DOUBLE HEIGHT
NOW WE ARE BACK TO STANDARD CHARACTERS AGAIN
DOUBLE WIDTH + DOUBLE HEIGHT
18 CHARACTERS PER INCH WITH DOTTED UNDERLINE
DOUBLE HEIGHT 18 CHARACTERS PER INCH DOUBLE WIDTH UNDERLINED
DOUBLE UNDERLINE NOW SINGLE UNDERLINE AND DOTTED UNDERLINE
SINGLE UNDERLINE DOTTED UNDERLINE DOUBLE UNDERLINE
DOTTED UNDERLINE SINGLE UNDERLINE DOUBLE UNDERLINE
```

This dump (not to actual size) was output from an Olivetti JP101 printer with Electron, View and Plus 3

Exploiting the concept

Sir, May I correct the impression that the Concept Keyboard is a 'new' device (*Acorn User* June and September 85); it is in fact more venerable than the BBC micro!

A number of factors have restricted the acceptance of the Concept as an input device – its price, policy decisions at MEP, difficulty in preparing software and its initial association with the handicapped are some of them. Those of us who have learned to live with its foibles and to exploit its potential can, however, only feel pity for other children.

Fortunately, the children with whom I work have always had Concept Keyboards. We have a graded series of overlays giving spiral curricular access to Dart and MEP's *Shopping*. And because the overlay is paper, it can be their recordsheet as well. For the teacher, the single-press entry style of interaction gives better insight into the process of a child's learning.

Unfortunately for software availability, this use of the Concept to improve interaction with published software, while it keeps our own micros busy, does preclude passing it on (legally) to others.

The real difficulty with the Concept, however, is that the development of software is in its infancy, and the industry's expertise has been devoted to making the typewriter-style keyboard work. The Concept requires an approach to input as radically different as the WIMPs (windows, icons, mice and pointers) which are all the rage on business micros.

My own view is that, by promoting (for national economic reasons) computers with typewriter-style keyboards for use in schools, particularly primary schools, the MEP, DES and DTI collectively have set back the educational use of micros by five years. As a result the microcomputer industry, is now sinking in a sea of poor quality software, itself a function of inappropriate hardware design.

MP Doyle
N Yorks

Typewriter tie-up

Sir, Alan Reekie appears to be making a mountain out of a molehill in trying to interface an Olivetti typewriter to a BBC micro (*Acorn User*, June '85).

Nearly all quality typewriters from the major manufacturers are available with an RS423 interface, although you would have to pay extra for it.

I use a Canon AP400 electronic typewriter with interface (as supplied by Canon) which plugs simply into the Beeb. It's necessary to set a series of DIP switches on the interface for word length, parity, line-feeds, etc, but this is no more difficult than setting up a parallel dot-matrix printer.

Such a serial typewriter can then be used with any popular wordprocessing chip. I use *Wordwise Plus* and the interface manual tells you the control codes necessary for those characters that do not occur 'naturally' on the Beeb, eg, £, underline on/off, boldface on/off, fractions, etc. In general as long as the character appears on the daisy-wheel, it should be printable.

Richard Grant
Newcastle

North of the bulletin border

Sir, I think your magazine doesn't publish enough telephone numbers of bulletin boards especially those in Scotland.

This is my only criticism of your magazine, and your articles are of a very high standard indeed. I find a lot of helpful ideas and information within the covers of *Acorn User*.

Paul Jarrett
Glasgow

We're quite prepared to print more numbers, but we need to be told them first! August's issue was at least along the right lines (we hope)!

page 56 ▶

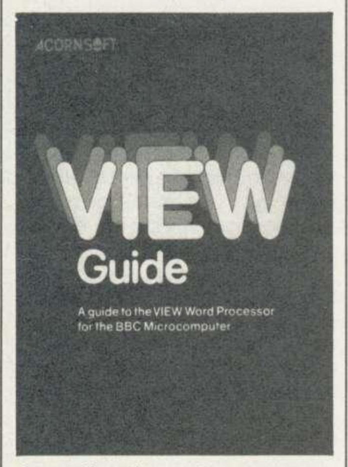
More than one View

Sir, I recently upgraded from *View* 1.4 to *Hi-View* and now see that *View* 3.0 is soon to be released.

Would it be possible for your magazine to put pressure on Acornsoft to supply *View* 3.0 to people like myself at nominal cost?

Tom Murphy
Co Louth

We put a bit of pressure on Acornsoft and were told that there will be an upgrade service for all versions 'at a reasonable cost'. Details will not be released until *View* 3.0 is available in the shops – which it should be by now.



Acorn User has put pressure on Acornsoft to offer an upgrade service for all versions of *View*

Spaced-out printer

Sir, I have derived considerable pleasure, and profit, from reading George Hill's articles on printers in *Acorn User*, and thought you might be interested in my rather bizarre experience with the Shinwa-CTI CP-80 dot-matrix machine.

About six months ago I bought one. It came complete with a free cryptogram labelled 'manual' – the joke being that only if you know what it is trying to convey can you make any sense of it. However, largely on the basis of knowledge gleaned from *Acorn User* I got going, and recently took a deep breath and had a shot at writing a simple screen dump.

The manual was clear on one point: since the distance between any two dot plates of the print head is 1/72 inch, any line spacing in increments proportional to the distance between the dot plates can be established.

So I duly set my spacing with ESC A + 8 to 8/72 inch. All went well. *Too* well, as I began to realise. The horizontal spacing is 640 dots per 7.5 inch line, or 85 dots per inch, so the picture should be elongated. But no – circles and squares came out perfect.

The answer is that the machine is programmed to output a spacing of (about) 20/216 when an instruction to operate at 8/72 inch is entered. But, mark this, 24/216 gives a true 8/72 inch spacing – and all other settings from 4 to 12/72nds are dead accurate, no more than one per cent out when 36 lines are printed.

I dare say to a Japanese mind all this is logical, but not to me. I'm now terrified of the damn thing. Who knows, it may bite!

W E Trevelyan
Surrey

An exciting little beast

Sir, In the July issue of *Acorn User*, at the end of his review of the B + micro your technical editor Bruce Smith says 'Acorn has never shown interest in anything as exciting as the 68000'.

Obviously he has yet to learn of the existence of the NS32000 series, which Acorn uses in its second processor and the ABC 200, which is *far* more exciting than the 68000 (or even the 68020).

C W Martin
Sheffield

Bruce Smith replies: Yes, the 32016 is an exciting little beast – and at £700 plus an absolute snip for the average home user! (That's not including the B + either!)

Does P-System live up to Acornsoft's promises?

Sir, Just after Christmas last year I received the P-System (release 1.0) for the 6502 second processor – a potentially powerful operating system with Pascal and Fortran compilers.

I expected a lot from the P-System, but unfortunately the implementation by TDI is a failure in many respects. The errors and omissions which I soon stumbled upon have been hampering my use of the system.

According to the package, TDI is supporting it but they have not answered my four letters. I have phoned Acorn and written several letters, but received only one reply. In his otherwise friendly letter, Mr Johnson-Davies admits only the lack of speed and of memory available for the user. There are, however, a great many other points of trouble, which he denies.

The list of failures is quite varied:

- Use of BBCUNIT (MOS interface) leads to crashes later. I have used only OSWRCH to set up a matrix printer (parallel).
- Although a separate two-word real Fortran compiler is included, the p-code interpreter needed to run the code is not. This also applies to the Pascal compiler, which has a two-word real option switch.
- The utility menu and the manual include a Character Editor program, but the program itself is sadly missing.
- The serial input port does not function at all, even though it is 'on line'. Attempts to use it lead to a system halt.
- The Disc Copy utility has a serious bug which destroys the system disc in case of a read/write error during the copying. Also some screen information is lost when the program is used on a disc which boots in mode 3.
- Crashes from time to time for unknown reason during system program operation with 'unimplemented instruction' error in HEAPOPS.
- Static variables are limited to about 16k for a reason undocumented (probably an error). Yet, at this point, plenty of space can be reserved for dynamic variables.
- Total memory available for user programs is 4k less (!) than on an Apple running the P-System without second processor architecture (BBC: 36k).
- The system is slow.
- Utilities like Spooler and Printer (text file formatted printing) are commonly included according to what I've read, but do not come with this package.
- No utility is included to convert between P-System files and DFS files (eg, *View* files).
- Free memory decreases with every program that is executed (stack management error?).

Quite a respectable list for a package priced at £299, I think.

The P-System itself is very useful, but in my opinion the present implementation is really a let-down and should not be bought by any professional user who wishes to use it to the full.

For those who have the system it may be a good idea to join the P-System Users Society USUS (UK) (PO Box 448, Chelmsford CM2 8QB), in order to be able to exert proper pressure on Acorn and TDI to live up to their promises of the 'complete operating system'.

Arjen Raateland
Helsinki
Finland

Paul Fellows of Acornsoft replies: The TDI P-System consists of just under 400k of software on two (full) 80-track discs. Lack of space prevented the inclusion of the short-precision arithmetic package which was not considered to be important. The character editor was also left out because it is not a vital part of the P-System and soft characters can be set up easily with VDU 23 commands. Modules such as the Spooler do not form part of the P-System: they are additional utilities which can be obtained from TDI as can the Advanced Development Toolkit.

We have not been able to reproduce any of the system crashes or disc corruption which Mr Raateland complains of and I would like to hear from any other users who think they have had such problems. The trouble with the serial port has now been fixed and a new release is available to users who request it.

The reason that the system may appear to be slow is that it uses the disc as virtual storage in order to run what is a very large and complex piece of software.

Putting the boot in

Sir, I was disappointed to see Francis Pettitt (*'Sage – on balance a wise buy*, March) making negative asides about Torch products without then pointing to simple and readily-available solutions.

GCC should have made the position clear in their documentation (as should Torch when they first replaced CPM with MCP), but to make a meal of the point is absurd.

I know nothing of GCC's product, but the Torch side sounds pretty standard. If Francis wants his Beeb and Torch ZEP to boot directly to the 6502 all he needs to do is hold the B key down when he turns on his computer (or when hitting Break if the computer is already on). Pressing Break will then activate the disc system. Control/Break will restore the Z80.

This applies to most versions of MCP and avoids problems with the MCP ROM when in Beeb mode. The only standard autostarting MCP is Plus 100. This autostarting can be avoided by holding caps lock when turning the computer on. All very simple if you know how.

Patrick Lefevre
London

As you say, simple when you know how, but reviewers aren't expected to be experts on every aspect of a system, especially if the matter isn't in the manual. But thanks for the tips.

One man's meat . . .

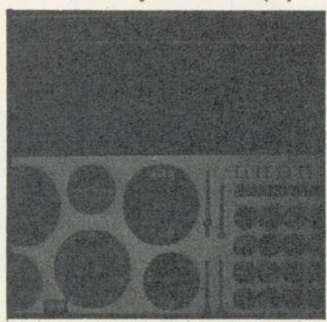
Sir, In a world where corruption and deceit are so prominent and advertising is the personification of these two characteristics, BBC micro and Electron users are looking increasingly to reviews in top-notch magazines like *Acorn User* to expose the truth about commercial software and hard-ware.

May I therefore seize the opportunity to express my somewhat dubious sentiments towards your software game reviews. It appears to me that the reviews are superfluous, contradictory, too reserved in a scathing attack on a really pathetic game, and infested with unfunny attempts at wit.

An especially blatant (but by no means atypical) example of all these diabolical characteristics (bar the last – to be fair) is Jonathon Gill's explanation of *747 Flight Simulator* (April '85). The sheer unprofessionalism of an extremely mediocre, overpriced game obviously made an impact on our well-meaning reviewer and provoked comments such as '. . . to my horror I found it was written in Basic . . . the screen presentation is very poor . . . only drawn in two colours . . . pilot's view is very disappointing'.

I commenced reading the final paragraph expecting a culmination of the previous criticisms and a strong ultimatum to avoid the game like the plague. Instead, and to my utter amazement, Mr Gill talks of the accompanying instruction booklet as if its brilliance excused the poor quality of the game.

A frequent violator of the wit rule is Harry Sinclair. (I just



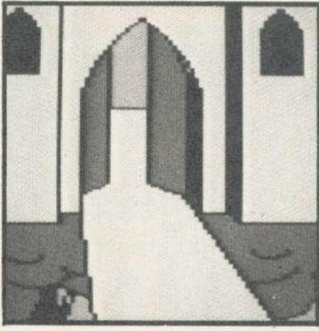
747 Flight Simulator: was our reviewer too soft on it?

love that name!) In his recent review of *Emerald Isle* (June '85), he indulges in humour at his wife's expense and to everyone else's displeasure.

Despite the somewhat direct nature of this letter it is not meant to be taken as a threat. It is just that in the pursuit of excellence there must be no weak links – loosely translated as, elevate software reviews to the high standard set by the rest of the magazine'.

Adam Blackwell
Vernouillet, France

Acorn User attempts to strike a balance between fact and humour – especially in games reviews, where the product may be intended to amuse. They are opinions, and each reviewer has his or her views. If Jonathon Gill thought the manual was worth the price of the game, that's what he felt. Take *Acheton* – described in the December 1984 issue as



Emerald Isle: Harry Sinclair's humour in his review was not to everyone's taste

'adventure of the year' – yet in August this year, the reviewer isn't nearly as enthusiastic!

As to Harry's wit being 'to everyone else's displeasure', well, you're entitled to *your* opinion . . .

Give us what we want

Sir, I regret that a failing of *Acorn User* (and all other computer magazines) is that you do not seem to recognise that many micro users simply use them as a tool. They have little or no interest in the intricacies of programming, couldn't care less how many GOTOs are in a program as long as it does the job, and do not wish to play moronic games.

Dealers are even worse. Few seem to know much about what they are selling. They are simply jumping on the bandwagon to feather their own nests.

As a professional journalist I use my model B every day for its wordprocessing power (*Wordwise Plus*), its simplicity of operation, and its ability to communicate directly with my editor's personal computer.

What would interest me would be simple routines to get even better use out of my wordprocessor. To that end, I must applaud George Hill, who has provided a number of programs to help fathom out the indecipherable Epson manual! Similar routines modified to take advantage of some of the facilities of *Wordwise Plus* are called from a !BOOT file which then selects *Wordwise Plus*. A couple of key strokes and hours of work may be saved.

I do not want to spend hours at the keyboard typing in some apparently useful program, only to find that it doesn't work because an important line has been wrongly printed; or to buy an expensive package only to find it doesn't work because it clashes with some piece of hardware already present in my machine.

Unfortunately, however, most reviewers seem more concerned with describing facilities which can be found in the manufacturer's literature, than explaining how to *use* the hardware and software to their best advantage, and stating whether they are compatible with other pieces of equipment such as ROMs, Aries B20 or 6502 second processors.

I have a number of ROM and disc packages for my computer, bought with the hope that they would further aid me in my use of the magazine. Some clash with one another. Those programs which might have been useful, either suffer because the writer of the manual expects too high a level of knowledge on the part of the user, or the programs are so difficult to use that they are effectively worthless.

Computer Concepts make some excellent software, but their manuals are very heavy going for the uninitiated. I am sure I could do some amazing things with Printmaster etc, if only they were explained properly.

We haven't the time to learn. That's why we bought our computers in the first place, to enable us to replace work with leisure – not to create even more work!

So *Acorn User*, tell us how to get the best out of our machines. Unravel the mysteries of databases, spreadsheets, toolkits, wordprocessors and the mass of hardware to enable them to give the best service. Tell us what your programs are doing...and how... and why. Tell us whether the programs are serious products or mere toys.

Graham Mayor
Manchester

Lend us your library ideas

Sir, I would be interested to know if you are aware of any instances where the BBC micro has been utilised for school library automation, ie, circulation, cataloguing, acquisitions, etc, with details of the appropriate software.

Roy Stall

Over to you, readers! (ED)

page 59▶

All this can happen when you Plotmate your micro

Plotmate is new. Excitingly new.

It's a rugged, responsive flatbed plotter with a lot of built-in magic.

You can use it to create fantastic patterns. Some small as a postage stamp. Or big as an A2 poster.

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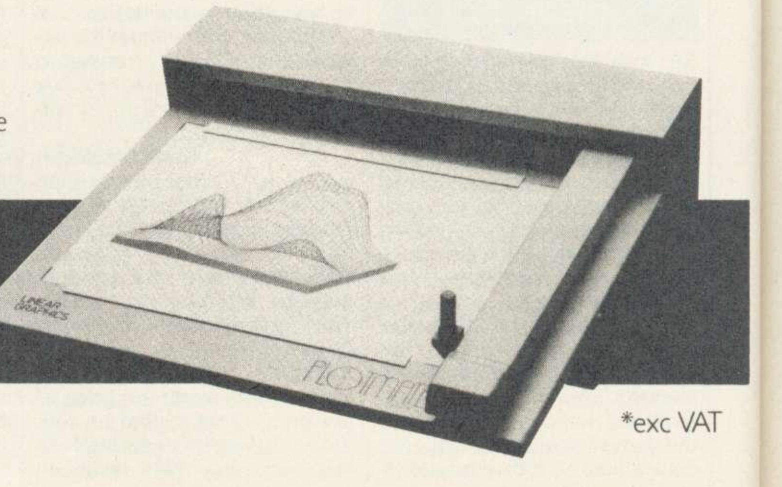
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Index linked

Sir, For some time I have been keeping an index to the various computer magazines that I buy regularly, and keep this in a database program.

This involves a lot of tedious typing and the titles often don't give any clue to the contents of an article. I wondered if it would be possible for magazines to provide a detailed index each month in a form that could be read by the computer?

J M Briscoe
Fort William

There is already a bibliography for sale on disc from McHugh Enterprises at £7.95 (state 40 or 80 track). The address is 43 Hookstone Oval, Harrogate HG2 8QE.

Printer plea

Sir, Could readers help me with a booklet I am compiling? It's a cross reference to control codes and functions used by current dot-matrix printers and I need the summary of these – usually to be found at the back of the printer manual. The sender of the first summary received of each printer will get a copy of the book.

There is a need for a work of this kind because many programs use a code peculiar to a certain printer, but an alternative can often be found that is compatible with more printers.

J S Mackenzie
24a Thicket Road
London SE20 8DD

Software for the handicapped

Sir, In reply to the letter from Mr Hall of St George's Hospital Medical School (*AU*, December), we would like to say that, under the sponsorship of Toy Aids, Lodbourne Farm House, Lodbourne, Gillingham, Dorset we are making and using software for the BBC micro for severely and profoundly handicapped children.

We have programs to encourage usual and auditory awareness, and facilitate control by the children by means of large, sensitive switches, available through Toy Aids.

Programs for the more able children include colour matching, shape matching and 'Odd man out'.

They have been proved to be educationally valuable and attractive to the children in our school.

We would also be happy to pass on information about other sources of software to enquirers.

Janet Slade
Nine Acres School
Robert Street
London
SE18

What price an update

Sir, How's this for nerve? Hearing that at last a disc version of *The Hobbit* was available, I contacted Melbourne House to enquire about an update for those, like me, who bought the cassette version. 'It is not company policy to support updates', was the reply.

It expects us to fork out another £17 if we want the luxury of a program that will load in less than eight minutes and has the graphics which the cassette version lacked.

I, for one will be looking out to avoid being caught by this company again. Can it really be surprised if software piracy goes on?

Dr N B W Thompson
Harrow

Alternative characters

Sir, Here's some information in response to your request for alternative Teletext character sets.

Mullard's data sheet for their SAA5050 series details the following variants:

5050	English
5051	German
5052	Swedish
5053	Italian
5054	Belgian
5055	US ASCII
5056	Hebrew
5057	Cyrillic

A telephone call to Mullard should confirm current availability.

M B Smith
Watford

Advice to a publisher on typesetting with a Beeb

Q I am a one-man publisher (mainly of high quality collections of poetry), making extensive use of a Beeb (OS 1.2, DFS 1.2) for accounts, wordprocessing and, most importantly, typesetting.

Typesetter commands are embedded in *Wordwise* text files, which are then used to front-end a Linotron 202. Some of these commands are identical to *Wordwise* commands, eg, CEn; some appear identical but work differently, eg, INn where n = points x prespecified width factor, not typewriter spaces; some are completely different, eg, Tn to change text typeface, or ^/'v to start/end superscript.

I would like to know if I can use *Wordwise Plus* instead of my current *Wordwise* 1.2? I've been told that it rejects unknown embedded commands as errors, which would make it useless for typesetting. I've read the *Wordwise Plus* review in the August issue and am none the wiser. I've played briefly with *Wordwise Plus* and am baffled.

Please help – extra features like segments would save vast amounts of time, but £40 plus is too much to pay for a fancy way of writing letters.

My second problem is that lack of memory in 80 column (preview) mode is driving me up the wall – what would you advise as the cure? I've considered an Aries B20 RAM board, a Raven 20 RAM board, or a 6502 second processor. If the 6502 could be used to produce – and preview – very long text files in *Wordwise* then it would be worth the much higher cost.

Michael Farley
Durham

A We asked Quorum who typeset *Acorn User*'s bar code listings direct from disc, and some of Computer Concept's own manuals straight from *Wordwise* discs to reply to Michael's queries . . .



Wordwise Plus is a more than suitable alternative to *Wordwise* 1.2, and for typesetting purposes it can be strongly recommended.

In addition to the tremendous time savings and convenience of the segment principle, Computer Concepts have provided a Redefinable Print Sequence command which has been used with great success for typesetting coding purposes. This feature allows the author to define up to 10 print sequences, each one of which may be called via an OPSP-9 (Output Print Sequence) command. These OPS commands can be used by the author to define different printer styles, and the same commands can be used by your typesetter to call the appropriate typesetting parameters. Unknown embedded commands are not thrown out by *Wordwise Plus*, therefore can still be used.

In answer to your second question, Computer Concepts do not claim that *Wordwise* will work with the Raven 20 RAM board.

The Aries B20 RAM board would allow you to preview all your text in 80 column mode but would not extend your maximum file length.

A 6502 second processor with *Hi-Wordwise* (£5 from Computer Concepts) would allow you to preview your text in 80 column mode *and* extend your maximum file length to approximately 40k.

Another possibility you do not mention is the Continuous Processing ROM (from Norwich Computer Services). This contains a number of programs which allow you to stream any number of smaller files while previewing in 80 column mode. Thus to all outward appearances, maximum file lengths can be up to the limit permitted by your disc system and they can be previewed in 80 column mode.

MATHS IN MOTION

There's a quick way and a slow way of plotting Lissajous curves: Michael St Aubyn's program takes the short cut



LISSAJOUS patterns, the familiar and attractive rotating loops, are formed on an oscilloscope when the dot's horizontal and vertical positions are controlled by sine waves. To create a similar effect on a computer the location of each pixel must be calculated by trigonometry, a very time-consuming operation that slows the program down to a crawl. Fortunately, there's an alternative method which is not only fast enough for animation, but also allows complex mathematical functions that could never be shown on a real oscilloscope. (But don't let the maths worry you – the program is quite self-explanatory and needs no mathematical knowledge.)

This method requires two look-up tables, one containing every possible X value, the other every Y value. The tables are compiled only once, and are then accessed repeatedly by the animation routine. When run, listing 1 shows this in practice.

The procedure PROCinitialise (line 160) fills the tables xwave and ywave with 256 X and Y values, calculated in lines 440 and 460 and scaled to the range 0-255. It takes several seconds (depending on the complexity of the functions you are using) so a counter is drawn to show progress.

The animation routine is written in assembler for maximum speed. It cycles through the tables extracting X and Y co-ordinates, then converts them to a screen address and plots a pixel. This is performed 256 times to draw a complete pattern, after which the process is repeated using different starting points in the look-up tables.

Unlike the trace on an oscilloscope, the previous pattern does not fade away by itself, so before each new pixel is drawn, the one it replaces must be rubbed out. This is achieved by using three tables: lostore, histore and bytestore, which hold the screen address of every displayed dot. When the old pixel has been rubbed out using the stored address, the new one is drawn and its address saved. In this way, 256 pixels are always present on screen and the pattern flows smoothly.

The shape and motion of the display can be varied immensely by fiddling with PROCinitialise. The most obvious way is by changing the contents of the look-up tables, but there are also a number of Basic variables that you can experiment with:

- phasediff determines the phase difference between the X and Y waveforms from which the pattern is composed – the rotation is affected.
- xspeed and yspeed control the velocity of the waveforms. If you double both variables, the pattern will move twice as fast: if you make them negative, it will spin in the opposite direction.
- xfreq and yfreq set the frequency of each waveform – adjusting these often creates an entirely new pattern. When you have entered listing 1, try changing xfreq to 1 and yfreq to 127.

The frequency can also be altered



while the program is running by using the cursor keys: right and left to increase and decrease the X frequency, up and down to change Y. The current values are displayed when you freeze the pattern by pressing the space bar (press any key to get it moving again), and you can restore the original settings by pressing Return.

The program initially draws an 'inverting dumbell' pattern derived from the sine cubed function in line 440 – it can be changed to the more familiar Lissajous figures by altering two of the lines in PROCinitialise:

```
440 x=SINa
490 xfreq=-2:yfreq=-1
```

Substituting more complex functions produces more complex shapes:

```
440 x=SIN(PI*SINa)
490 xfreq=-1:yfreq=1
```

Here is another suggestion:

```
440 x=SIN(a*A%/255)
490 xfreq=-1:yfreq=1
```

In the examples so far, all the Y values have been calculated by simply using y=x. However, many interesting effects can be obtained by using different functions for X and Y:

```
440 x=SIN(a*A%/255)
460 y=COS(a*A%/255)
490 xfreq=-1:yfreq=1
```

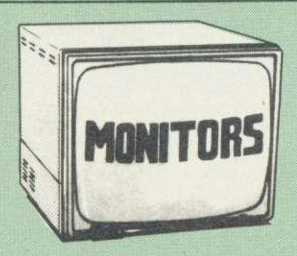
There are, of course, many other possibilities. Functions that include trigonometry tend to produce the best results, but powers, logarithms and quadratic equations are worth experimenting with. If you discover any unusual effects, make a note of the settings which produced them, or save the altered program using a name that describes the pattern, so you can replay it later.

Michael St Aubyn's 'Maths in Motion' listing is on yellow Pages 106-107

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THE EPSON RX/FX/KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX/KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English how to use your printer (Kaga KP810, Canon PW1080A, or any other Epson FX-80 compatible printer) with the BBC micro, both from Basic and your Wordwise wordprocessor.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

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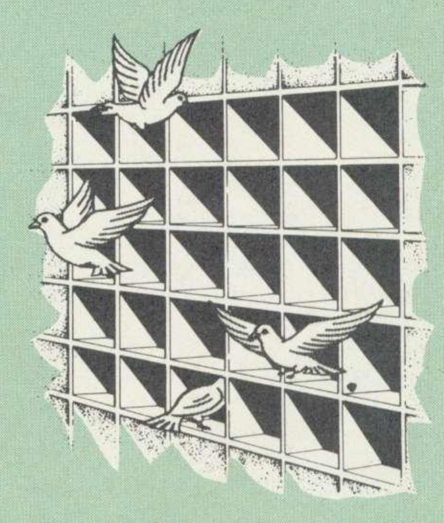
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File-Plus is a powerful database for the BBC micro with many advanced features. Largely menu driven, File-Plus is provided on a 16k ROM with some extra utilities on disc. Features included are detailed below:

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Continued →

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

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- *FULLY controlled by simple '*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON/OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
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We, at Watford Electronics, have been producing high quality hardware and software products for the BBC for three years now. Having carefully observed the needs of our customers we set our top hardware engineer the task of producing the ultimate ROM board to meet all your ROM/RAM requirements.

After weeks of top secret development we are now able to bring you more details of this, the ultimate in ROM/RAM boards.
● No overheating problems. ● No User Port corruption. ● Full buffering. ● NO SOLDERING. ● Firmly mounted. ● Easy fitting. ● Up to 8 banks of 16k of Dynamic RAM. ● One bank of 16k CMOS Static RAM allowed. ● All RAM has Write protect. ● All CMOS RAM has Read protect. ● CMOS RAM can have battery backup. ● Special RAM write register. ● Can run any BBC ROM. ● FREE utilities disc. ● Compatible with DDFS boards. ● Compatible with our 32k RAM Card. ● Compatible with our Sideways ZIF. ● Large printer buffer (up to 128k) ● High speed disc backup via RAM.
Obviously, so much RAM requires some powerful facilities to use. To show you just how powerful the features our board offers are, and to convince you that the competition if any, is just simply not worth buying, we shall provide some more details on the advanced features offered.

Each socket has write protection to allow all ROM based software to be run. Also, to help during software development, each socket is equipped with a special read protect facility (this allows recovery from ROM crashes).
Up to 8 ROMs and 8 banks (each of 16k) of RAM may be used, or one of the ROMs may be configured to give 16k of battery backed CMOS Static RAM.

The RAM socket selection (which is independent of the normal ROM socket) is performed by a special register at &FF30. In normal systems, a "write" to this location would have no effect. We believe that there is available an inferior board in which, for some totally unexplained reason, the User Port (as used by the AMX Mouse, Eprom Programmers, etc.) is used for the selection. Obviously this was not a very sensible move on the part of this manufacturer.

The ROM/RAM card from Watford represents second generation ROM board technology and is a must for all serious users of the BBC Micro.

Please write in for technical details and further prices.

INTRODUCTORY PRICES:

- ROM/RAM CARD with 32K Dynamic RAM **£45**
- ROM/RAM CARD with 64K Dynamic RAM **£69**
- ROM/RAM CARD with a massive 128K RAM **£109**

OPTIONAL EXTRAS:

- 16K Plug-in STATIC RAM **£14**
- Battery for Battery Backup on Static RAM **£2**

The ULTIMATE DFSs for the BBC MICRO

WATFORD TOPS THE DFS CHART

Watford's Ultimate DFS has scored highest points in ACORN USER's unbiased DFS's Review of July 1985.
In concluding, the reviewer writes "It must be said that Watford's DFS certainly offers a comprehensive range of facilities at a very attractive price". (Please write in for comprehensive details.)
To celebrate the occasion, we are offering Watford's complete Disc Interface Kit at only £59 and the Double Density Unit at £66.

Just compare the features:

Features	Acorn 1.20	Watford Single Density	Watford Double Density
Max nos. of files per disc side	31	62	62
Max disc capacity	800k	800k	1440k
Tube compatible	Yes	Yes	Yes
Built-in Editor	No	Yes	Yes
Built-in Formatter	No	Yes	Yes
Built-in Verifier	No	Yes	Yes
MRUN a file	No	Yes	Yes
MLOAD a file	No	Yes	Yes
Extended RENAME	No	Yes	Yes
Selective COPY	No	Yes	Yes
Default file name	No	Yes	Yes
Disc space distribution	No	Yes	Yes
40/80 Software Switchable	No	Yes	Yes
Wide catalogue	No	Yes	Yes
Close open files	No	Yes	Yes
Improved OPENOUT	No	Yes	Yes
Copy between densities	N/A	N/A	Yes
OSWORD &7F	Yes	Yes	Yes
Full entry point compatibility	Yes	Yes	Yes
Retain information over a break	1.20 partial	1.43 Yes	1.53 Yes
Games compatibility	Yes	Yes	Most
Econet file server	Yes	Yes	Yes
Econet station	Yes	Yes	Yes
Full wildcard facilities	No	Yes	Yes

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for two years, and has gained a large following amongst serious users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade.

PRICES

- *Complete Disc Interface Kit incl. DFS ROM & fitting instructions* **£59**
- *Acorn's DFS Kit complete* **£60**
- *DFS Manual (Comprehensive)* (no VAT) **£6.95**
(P.S. Our comprehensive DFS Manual covers both Acorn & Watford DFSs)
- *Watford's sophisticated DFS ROM only* **£16**
- *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only* **£12**
- *Watford's DFS is exclusively available from Watford Electronics. Every ROM carries a special label with our LOGO and serial number.*

WATFORD's DOUBLE DENSITY DFS INTERFACE

The DDFS from Watford Electronics represents a new standard in DFSs for the BBC micro. This is a double density version of our popular single density DFS, and combines all the features of this powerful DFS with the advantages of a system that gives 80% more storage per disc in double density mode. P.S. – Please note that not all DDFSs are capable of providing either the full 80% storage increase, or of allowing a file the full size of the disc – Ours allows both of these!

The typical piece of games software these days is provided upon a protected disc. In order to work on any double density system (including the others on the market) a protected piece of software needs to make calls through the OSWORD &7F routines. To ensure compatibility, the Watford DDFS features probably the most comprehensive and powerful 8271 emulation ever written for a double density system.

PRICES

- *Complete DDFS Kit incl. fitting instructions* **£66**
- *DDFS Manual* (no VAT) **£6.95**
- *We will exchange your existing Single Density DFS Kit for our DDFS Unit at* **£35**

Quality Disc Drives from Watford Electronics

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates the single density capacity. The double density storage capacity is second one, (that within the brackets). All disc Drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track and which are 80 track. The 40 track ones are manufactured by EPSON, the world famous Japanese company, (non-tinted boxes). The 80 track drives are famous MITSUBISHI drives (tinted boxes).

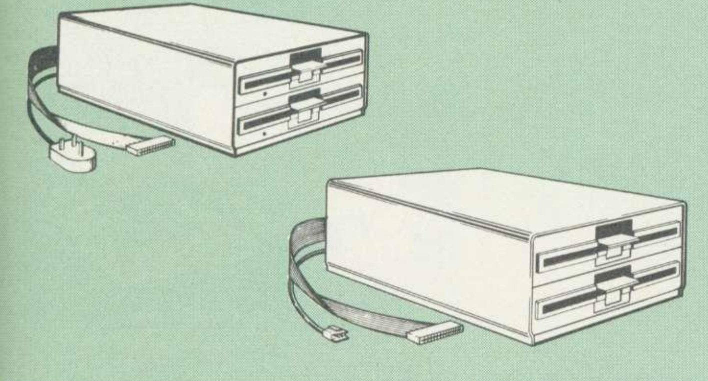
With two prices in a box (e.g. £295/£299), the first price is for the standard drive and the second for the same unit in switchable type. Users of either of the two Watford DFSs will not need switchable drives as their DFS will provide software switching for them. Users of Acorn's DFS will find that they need to pay the extra for switchable drives if they wish to use 40 track discs in an 80 track drive.

The drives we supply are fast (3ms track to track, 15ms settle), quiet and have a low power consumption (average well under 1 amp). Extensive experience of the usage of disc drives suggests that the MITSUBISHI and EPSON drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.
Various other "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality Epson and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

Names you can trust, at prices you can afford!

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.
Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate: extensive tests within our workshops have confirmed this. All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. (Ideal for Schools & Colleges. All single disc drives with power supply, (i.e. CS100, CS200 & CS400S) are supplied in a twin case with twin data cable for later inclusion of a second drive). At Watford we anticipate your needs of tomorrow not just today!

All disc drives advertised here will operate in double density mode with the appropriate interface and software.



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
100K (180K)	CLS100 £82		CS100 £105	
200K (360K)	CLS 200 £84	CLD200 £162	CS 200 £107	CD200 £172
400K (720K)	CLS 400 £99 / £115 CLS400S	CLD 400 £162	CS400 £109 / £130 CS 400S	CD400 £175
800K (1.44M)		CLD800 £189 / £230 CLD 800S		CD800 £199 / £235 CD 800S

● TWIN drive CASE, with Power Supply & Cables **£35**
Securicor carriage on Disc Drives £5

Prefix *C = Cased Drive*
L = Less PSU
S = Single
D = Double

Suffix *S = 40/80 Switchable*

e.g. *CLS400S = Cased drive, Less power supply unit, Single 400K, Switchable (40/80 track).*

MYSTERIES OF DISC DRIVES & DFS REVEALED

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

For instance, what is the difference between single and double density formats, how can you use a 40 track disc on an 80 track disc drive? What is the difference between a DFS and disc interface kit? Should you acquire a single Disc drive or twin? What does 48 TPI and 96 TPI discs mean? These are just a few of the questions you may have asked yourself and never found the answer or maybe you have yet to encounter these questions.

Now the mystery of buying a suitable interface and disc drive for your BBC micro is revealed in Watford's new book entitled 'MYSTERIES of DISC DRIVES & DFS REVEALED'. It describes in fine detail, yet remaining very readable to the beginner, how disc drives operate, the type of interfaces available, which type of discs to use on a disc drive and how data is stored on the discs.

£5.95 (Book No VAT)

3M – 5¼" DISKETTES

Top quality 3M – SCOTCH Diskettes from Watford Electronics (Your 3M Appointed Distributors). All our discs carry a lifetime warranty. These discs are quiet in operation and insert positively with their reinforced hub rings. Boxes of 10 supplied complete with self stick disc labels and write protect tabs.

- *10 × S/S D/D 40 Track Diskettes* **£13**
- *10 × D/S D/D 40 Track Diskettes* **£18**
- *10 × S/S D/D 80 Track Diskettes* **£22**
- *10 × D/S D/D 80 Track Diskettes* **£24**

QUALITY 5¼" DISKETTES at KNOCK DOWN PRICES

To complement the range of quality discs and disc drives that WE already sell, WE are now supplying some special offer packs of 10 high quality discs, each with a life-time guarantee. These are supplied packaged in an attractive plastic library disc box to protect them from damage.

DON'T SETTLE FOR LESS, BUY THE BEST

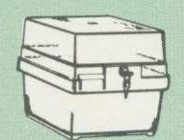
- *10 ×* **M4** *S-S D/D 40 Track Discs* **£11**
- *10 ×* **M5** *D/S D/D 40 Track Discs* **£15**
- *10 ×* **M7** *D/S D/D 80 Track Discs* **£20**

DISC ALBUMS

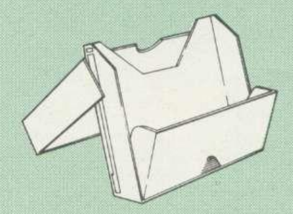
Attractively finished in beige leather-look vinyl, these conveniently store upto 20 Discs. Each Disc can easily be seen through the clear view pockets. **£4**

LOCKABLE DISC STORAGE UNITS

Strong plastic case that afford real protection to your discs. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.



M35 - holds upto 40 discs **£10**
M85 – holds upto 95 discs **£12**



PLASTIC LIBRARY CASES

FOR 5¼" DISC STORAGE holds 10 Discs. **£1.80**

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. **£8**

DUST COVERS (For our Disc Drives)

Single (without PSU) **£3.20** Twin (without PSU) **£3.85**
Single (with PSU) **£3.25** Twin (with PSU) **£3.90**

Continued →



Impress your friends and business colleagues with the quality of your letters and printed material with Watford's very simple to use EPSON NLQ! (Near Letter Quality) ROM. Suitable for FX80, RX80, RX80F/T, FX100.

Look at the features:

- Simply type *NLQ80/100 and a single VDU code to use NLQ print.
- NLQ is then available without any modifications from BASIC, WORDWISE, VIEW (with NLQ DRIVER) or virtually any other program or language.
- Single codes select PROPORTIONAL type (yes even on the RX80); ENLARGED type; UNDERLINED type. These features can be used seperately or in any combination.
- Full UK character set; Standard 'pica size'; Proportional spacing; Enlarged; Underlined; Normal type.

The NLQ ROM is supplied complete with comprehensive manual.

P.S. NLQ ROM is compatible with the Torch Z80 system and can be used from within the Perfect Writer software.

Only: £22

VIEW PRINTER DRIVER for NLQ ROM

This specially written printer driver has been designed to allow View access to the full features of our NLQ ROM.
A must for all VIEW and NLQ ROM users.

£7.00

THE NLQ DESIGNER

The Kaga Taxan KP810 and KP910 are two superb printers, as our many thousands of satisfied customers would surely attest to. One of it's particularly strong points is the NLQ option that it offers; perhaps one of the more weaker points is the effort required to design your own custom NLQ font.

Well the solution is here NOW in the shape of Watford's NLQ DESIGNER ROM! This powerful piece of software allows easy design and entry of a full NLQ font, with further fonts recallable from disc. Once a font has been programmed with the versatile NLQ DESIGNER, it can be saved to disc, downloaded to your Kaga (or Canon) printer, or even programmed into an EPROM (given the appropriate hardware) and then plugged directly into your printer so that it is available immediately when you turn it on. Downloadable Fonts require 6264 RAM chip fitted.

A 40/80 track format disc containing 3 example fonts is included in the package.

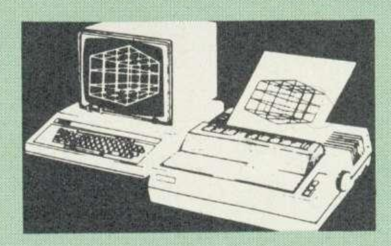
(P.S. This ROM is not suitable for Epson printers as they don't normally have NLQ ability. Keep reading our adverts though – work is in development!)

NLQ DESIGNER & FONT DISC **£25**

INDIVIDUAL Preprogrammed FONT ROMS **£15**

(Please write in for further details on both the NLQ DESIGNER and the individual font ROMs available.)

DUMPOUT 3



A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including all Mode 7 facilities etc. We have to admit that there is one facility that we cannot replicate – if anyone can supply flashing ink we would like to know!
The ROM also provides window setting utilities and two new OSWORD calls that allow mode 7 graphics pixels to be read and plotted using the standard graphic co-ordinate system. The latest version includes a graphic dump trigger for dumping screens from games whilst they are running.
Two commands are used to operate the dump routines:
*GIMAGE – This provides a full graphics dump of any graphics mode, plus modes 7 and '8'. There are many optional parameters but you need only specify the parameters you wish to change.

Features available include:

- Vertical and horizontal scaling through all the graphic modes and mode 7
- Rotation of the image produced through 90, 180 and 270 degrees
- Left hand indentation setting
- Screen dump window definition
- Colour grey scaling
- Two tone fast dump
- Special colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered dumps
- User port switched dumps

What does the independent press say!

Practical Electronics, May 1985
"The Dump Out 3 ROM from Watford Electronics represents one of the most sophisticated types of printer dump utilities available for the BBC Micro . . .".

"an extremely sophisticated and powerful dump utility".

"VERDICT – Dump Out 3 ROM has all the facilities which you are ever likely to need for producing printer dumps. The facilities available work extremely well and if printer dumps are something which you require, then this ROM can be recommended to help you to get the best out of your dot matrix printer".

The Micro User Feb. 1985.
"Well, here is that winner"!

"provide(s) some rather sophisticated screen dumps. Producing high resolution paper copies of graphic screens in any (graphics) mode will be the major reason for buying this ROM, and this is where Dump Out 3 performs PAR EXCELLENCE". (Our capitals for their italics.)

"The versatility of *GIMAGE (the graphics dump command) when using these parameters is amazing. Pictures of almost any size, shape, contrast or distortion may be produced without the need for a reducing photocopier or trick photography".

"Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC micro. It is easy to use yet highly versatile, and caters for all BBC screen modes in multitone high resolution printing. Whole, partial, rotated and scaled screens may be dumped to almost any BBC compatible dot matrix printer (see our list at the end of this advert). At £24 it must represent excellent value for money and surely cannot be beaten".

Designed for use with the following printers: CP80, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, LPVII, NEC PC8023, DMP100/200/400, etc. etc.
Price including comprehensive manual

£24

VIEW

VIEW WORDPROCESSOR
We are supplying the new VIEW version 2.1 allowing printing of memory contents etc **£46**

HI-VIEW

A special version of VIEW designed for use with 6502 2nd Processor. Available on disc, it offers 47K of text memory.

£49

VIEWSHEET (Acornsoft) £49

VIEWSTORE £52

Watford's own Sophisticated VIEW PRINTER DRIVER for Epson FX80 & KAGA KP

Only £9

VIEW DRIVERS FOR JUKI & BROTHER PRINTERS
Only £8

VIEW/VIEW SHEET PRINTER DRIVER for SILVER REED

(Officially approved by Silver Reed)

A range of VIEW Printer drivers to complement the Silver Reed range of printers EXP400/500/550 & 770 EB 50 and converted typewriters EX43/44 & 55.

Only: £8

BEEB PRINTER ROM



This utility ROM is designed to simplify using all the facilities of your printer. It has many facilities:

★ Selection of printer modes such as underline, font and size is by 'Single Key' operations.

★ From Wordwise, a single number following OC will select a mode rather than a long and incomprehensible string of control codes. This makes using your printer with Wordwise much more convenient.

★ When using Basic (or other languages) you can have control over the formatting of the output to the printer in the style of a wordprocessor. You can define page top, bottom and side margins etc. with intelligent page skip for binders an option. All supported printers will now respond to form-feed etc. commands.

★ User defined characters are printed as you see them on the screen so that non-standard characters are automatically printed out correctly.

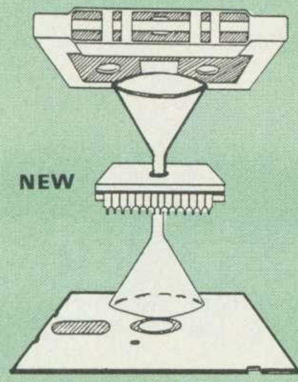
★ Commands select the options for the following printers:
GP100, STAR, NEC, MX/FX, KAGA, LP/VII/DMP100, DMP200.
Operates with either parallel or serial interfaces.

★ Supplied with a 50 page manual that is very comprehensive and easy to follow. Please specify printer type when ordering so that we can send the correct function key strip.

Price: £24

TRANSFEROM

(Tape to Disc Utility)



NEW

The only TAPE to DISC Utility ROM that works with our Double Density Disc Interface.

After months of top secret development, we are now able to supply details of this advanced and sophisticated utility ROM for the BBC micro. Just look at the features:

- Fully menu driven for ease of use
- Copes with locked programs
- A very comprehensive built in copying features
- Copies very long adventure games
- Supplied with comprehensive manual

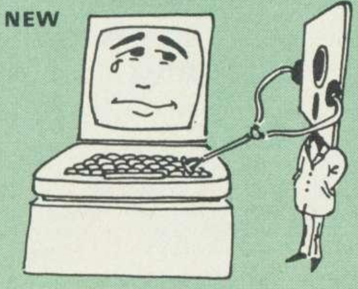
TRANSFEROM is now available in BOTH single and double density versions. The single density version works with both the Acorn and Watford single density DFSs. The double density version works with the Watford DDFS system only.

TRANSFEROM takes your software on tape and saves them onto disc. TRANSFEROM does not stop when one disc is full; you just insert another disc in and carry on with that one! Surely this is the most valuable investment you could make if you have tape software that you wish to transfer to disc! Please specify version required – Single or Double Density.

£22.00

DIAGNOSTICS DISC

NEW



The BBC micro is a very complex machine and thus diagnosing a fault can be very difficult. Until now, the only way to discover the nature of a fault was either to find a competent friend with a large degree of patience or to find your nearest dealer and pay him to find out what is wrong.

At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

Continued

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £18.00

ROMAS

THE CROSS ASSEMBLER AND MACRO EDITOR FOR SERIOUS PROGRAMMERS!



ROMAS is a carefully designed, sophisticated yet simple to use, development system for serious assembly language programmers. Using the BBC as the development system, you can choose your target system from the following processors:

6502, 65C02, Z80, 8085, 8041, 6809 and Z8 P.S. This includes the Acorn 6502 & Z80.

ROMAS features a powerful expression analyser, making complex table easy to generate. To aid in documentation, fully formatted assembly listings may be produced, with full symbol table output at the end.

ROMAS is provided with a powerful cross referancer to produce a listing of all the labels in a given "source" program; this makes it easy to check to see if you are about to duplicate a label.

The Macro Editor

Features of this powerful editor provided with the ROMAS package include:

- Works in all 40 and 80 column screen modes
- Fast load and save speeds
- Continuous line and column number displays
- Search, replace and move; all available in macros
- Command repetition

The ROMAS package includes a comprehensive manual, providing detailed documentation and plenty of examples.

A give away at . . . **Only £45**

Please specify 40 or 80 track disc when ordering.

ADE

'Systems' complete program development package in a 16K ROM. We are now supplying the new 6502 2nd processor compatible version.

SPECIAL OFFER ONLY **£43**

ULTRACALC 2

The mark 2 version of the BBC Publications' extremely popular electronic spreadsheet ROM.

Only: **£66**

THE INVESTIGATOR

This sophisticated Utility program on disc, enables you to make security back-up copies of most of your valuable Disc Software. Makes full use of all 8271 (will not run with double density DFSs) facilities to discover the precise format of your protected disc so that an exact copy can be produced. Supplied with detailed instructions. Please specify 40 or 80 track disc when ordering.

Only **£20**

NEW

ROM-SPELL



ROMSPELL is the new fast Spelling Checker ROM from Watford, Packed with excellent features, ROMSPELL is probably the most advanced spelling checker available for the BBC micro.

Features include:

- 30,000 word dictionary
- One pass check
- Two pass check
- Ambiguous word check
- Basic access to ROMSPELL
- Immediate entry check

ROMSPELL is fantastic value at **£23**

(Please specify 40 or 80 tracks when ordering)

BEEBMON

BEEBMON is the most powerful and versatile machine code monitor from Watford Electronics. BEEBMON offers some superb features specially designed to make the task of understanding and debugging machine code easier; indeed BEEBMON is probably the only product with sufficient power to aid in the debugging of such complex pieces of software as a DFS.
Offering a total emulation mode, BEEBMON can be used to single step through code anywhere in memory. All breakpoints are emulated and the workspace is totally relocatable, allowing for the simulation of all those "awkward" pieces of code.

£24

DISASSEMBLER ROM

Discover the hidden secrets of BASIC and the OPERATING SYSTEM with this easy to use progammers tool.

ONLY **£16**

Please write in for technical details.

ROM MANAGER

Probably the most powerful way of expanding the BBC micro is from the use of Sideways ROMs. One problem faced by the avid ROM collector is that of ROM command clashes. The solution is very simple in the form of the ROM that "Provides comprehensive management of all your installed ROMs". (Quote from BEEBUG November '84.)

Basically, ROM Manager offers you the ability to turn off any installed ROM, or to send any * command to any specific installed ROM. It is said that imitation is the sincerest form of flattery – Acorn's BBC Plus features many of the abilities of this powerful ROM.

Many more facilities available.

Price **£20**

DISC EXECUTOR

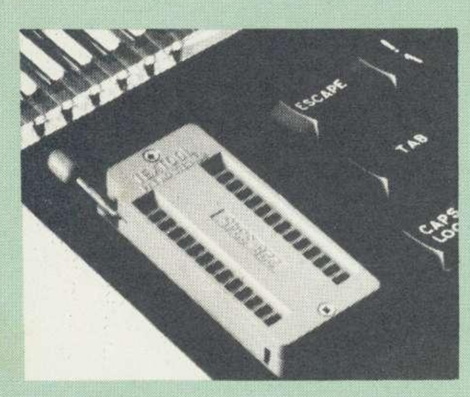
Disc Executor is a sophisticated disc utility for the transfer of your programs from cassette to disc. It copes with 'locked' files and full length adventures (up to &6E blocks long) and programs that load below &E00. Disc Executor is simple to use and provides menus to prompt the user along the way. Disc Executor will cope with the vast majority of tapes. (Please note that Disc Executor is not compatible with double density disc interfaces – keep reading our adverts though!)

Price only **£10** (40 or 80 track)

CLARE's SOFTWARE

BROM ROM	**£29**
BROM DISC	**£23**
BETA ACCOUNTS PACK	**£21**

SIDEWAYS ZIF SOCKET



Now Watford Electronics brings you a ROM board for small budgets or for those of you who do not wish to open up your Micro frequently. It allows you to change ROMs quickly and efficiently with the minimum of effort – no screws to loosen or keyboard to remove. The unit consists mainly of a zero insertion force (ZIF) socket on a small circuit board which is located into the position of the 'ROM Cartridge' and is connected to one of the internal ROM sockets via a ribbon cable.

● Very simple to install. NO SOLDERING REQUIRED. The ZIF eliminates the possibility of damage to your ROM pins when inserting and extracting them.

● The low profile of the socket allows unrestricted access to the keyboard, unlike other cartridge systems. In addition, there are no costly extras, such as ROM cartridges for every new ROM.

● All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

● This versatile hardware solves the problem of running out of socket space, simply unplug the ROM and plug in a different one. It is a real must for Professionals and Hobbyists alike.

ONLY **£15**

16K Sideways RAM Modules

This is it! The revolutionary design RAM Module you've been waiting for. Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- May be fitted in systems even with a ROM board.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Works with any ROM.
- Ideal for professional software development.
- Writes in &8000 to &BFFF region go to RAM.
- Assemble and *LOAD ROMs straight in to RAM.
- Supplied with utilities software disc.

Introductory offer: **£29**

Optional extras

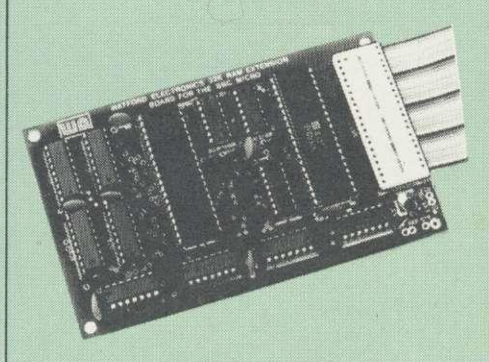
READ and WRITE protect Switches **£2**
BATTERY BACKUP £2

LOGOTRON LOGO

The popular Logotron Logo in ROM.
Recommended by most Education authorities.

Only: £55

32K RAM-
PRINTER BUFFER
EXPANSION BOARD



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

● IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.

● In "VIEW", type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

● In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This superb product is recommended by Computer Concepts for use with both Wordwise and Wordwise Plus. We wholeheartedly agree with this commendation.

● Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

● Use the FULL 32K or the bottom 12K of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS423 etc. Print large text files while running long graphics programs and have all your buffer options available as well (*FX15,21,138,145,ADVAL etc). Only 12K Buffer can be used in Wordwise or Wordwise + because of the way these softwares are written.

● Ensure COMPATIBILITY with a vast range of hardware (including Watford & ATPL ROM ' boards, double density boards, second processors), and software (including BASIC, TOOLKIT, VIEW, WORDWISE (1.20+), WORDWISE-PLUS). This is because our board, unlike those of our competitors, is connected to the computer by a ribbon cable.

● Achieve EASY OPERATION with ROM based software. A large range of commands is available for machine code and BASIC users, including some useful *HELP messages.

Offer price

Only: £60

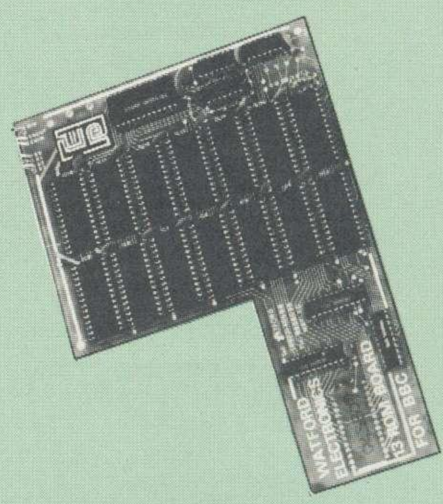
(Price includes a comprehensive manual and the ROM)

GRAPH PAD

With this popular British Micro's Graph-pad, you can add new dimensions to your computer enjoyment. It helps you to create your own application programs by the simple use of the Graphpad. Ideal for Educational use. Supplied complete with Cables, Manual and a two program cassette.

SPECIAL OFFER **£86**

Mk-3 13 ROM SOCKET EXPANSION BOARD



We are pleased to announce a revised version of our popular 13 ROM SOCKET board, now with even more features.

- Increase BBCs capacity for ROMs from 4 to 16.
- Easy installation; simply plug in with only 5 wires to solder.
- Minimal space needed.
- Compatible with our DDFS, RAM Card, Torch card, 2nd Processors, etc.
- Advanced low power chips keeps power consumption to a minimum.
- Very versatile Socket 14 can take 2716, 2732, 2764, 27128, 6116 and 6264 chips.
- *LOADs or writes in the region &8000 to &BFFF are automatically directed at the RAM.
- Auto-write protect line makes RAM look like ROM.
- READ protect line which makes socket 14 "vanish" – useful to get out of software crashes.
- On-board battery back-up option with a high speed charging circuit.
- Supplied ready-built and tested, complete with fitting instructions.

Price: Still Only £30

SOLDERLESS SIDEWAYS ROM SOCKET BOARD

Following the success of our 13 ROM SOCKET BOARD, we are proud to announce a new addition to our range – the New Solderless Sideways ROM Socket Board.

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16. Also permissable, are various configurations of RAM (up to 16K) and different sized EPROMS (see below).

- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- No soldering required.
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 can take the following chips: 2716, 2732, 2764, 27128, 6116, 6264.
- Auto write protect for RAM chips.
- Read protect to make RAM "Vanish"; allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £33
Battery backup fitted **£35**

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£55
CARETAKER Basic Utility	£28
Graphics ROM	£28
Disc Doctor ROM	£28
INTER-SHEET	£48
INTERCHART	£38
TERMI	£27
COMMUNICATOR	£58
SPEECH ROM	£25

Wordwise

Without doubt a very sophisticated piece of software for the BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER: **£32**

WORDWISE PLUS

FREE this month, the superb Word-Aid ROM with every package of Wordwise Plus bought from us **£47**

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Take advantage of the programming language in Wordwise-Plus. Simply load the disc with Shift-Break and have the power of these sophisticated new features instantly at your fingertips.

Features:

- Mail Merger
  * Can use Data files spooled from Wordwise-Plus.
  * Can use Data files from most databases.
  * Powerful Label printing facilities.
  * Mail merges with names, addresses etc. inserted into a standard letter.
- Address Finder
  * Search for names.
  * Search for addresses.
  * Insert names into text.
  * Insert addresses into text.
- Print/Preview continuous files.
- Chapter Marker.
- Search and Display.
- Remove embedded commands.
- Text transfer.
- Printer Codes – make embedding commands easier.
- Utilities supplied compressed for speed.
- Utilities supplied anotated for help.
- Supplied on 40/80 format disc.
- Very user friendly.
- Recommended by Computer Concept.

Introductory Offer: **£12**

(Further details available on request SAE, please).

BEEBFONT ROM

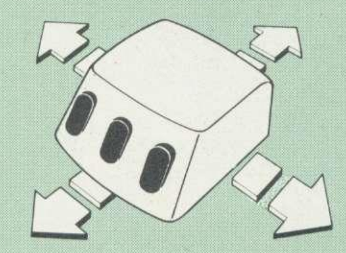
BEEBFONT is a remarkable and different concept in BBC software. It allows you to display text on the screen in 13 different styles. It is supplied complete with a Spooler and Editor on 40 or 80 track disc.
(Please write in for technical details).

ONLY **£25**

PCB NI-CAD Battery for ROM Boards. £2

THE AMX MOUSE

The AMX Mouse needs no introduction. It is simply the best.



Now supplied with the NEW SUPERART Software ROM & Disc at no extra cost.

ONLY: £67.95

We are giving away the sophisticated **COLOUR ART** Software package **ABSOLUTELY FREE** with every purchase of the AMX Mouse from us.

AMX DESK Package	£19.00
AMX UTILITY Package	£11.50
AMX SUPERART Package	£43
AMX PAGE-MAKER Pack	£43
AMX 3D ZICON Disc	£21
AMX Database Disc	£21
AMX XAM Educational	£21

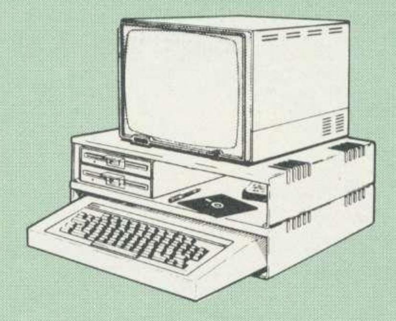
COLOUR ART

This novel program allows you to add COLOUR to any drawing produced with your AMX Mouse package, and really brings those pictures alive. Not with just any colours, mind you, but a full range from up to 255 different shades! It's simplicity itself to use this "painting by numbers" painter to create simple, striking and powerful images to please the eye.

Price **£10**

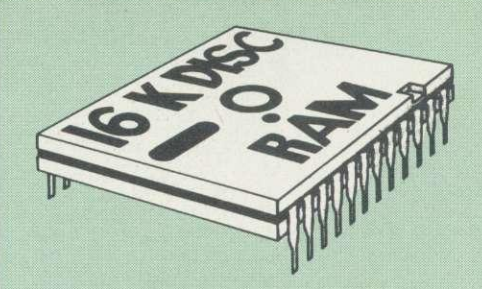
(please specify 40 or 80 track disc when ordering)

PLINTHS FOR BBC MICRO AND PRINTERS



Protect your computer from the weight and heat of your monitor. The BBC micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and monitor, whilst the double height version provides enough room for our stacked or side-by-side dual disc drives or TORCH Disc pack, to be placed in the centre section. If you use our stacked drives, the remaining space can be used for further peripherals e.g. Speech Synthesizer, EPROM programmer or simply stationery. The computer slides neatly in to the lower section allowing easy access to remove the lid. The printer plinth is equally sturdy but without the cooling slots. It allows for access to the paper from the front as well as from the rear, (a facility not often thought of in similar products) if the paper is located beneath the plinth. This is a very convenient way to work especially if your work area is not deep enough to take the printer and paper separately.

SINGLE BBC PLINTH .... **£11** (carr. £1.50)
DOUBLE BBC PLINTH .... **£19** (carr. £2.00)
PRINTER PLINTH .... **£10** (carr. £1.50)



This is the RAM you've been waiting for!! This battery backed up, write protectable 16K sideways RAM board allows you to run from disk every sideways ROM available. Beware of other sideways RAM boards which are not backed up as certain ROMs will not run in these boards even though the RAM can be write protected. The Battery Backup facility allows retention of DATA after power off. On switch on the Micro will think the WATFORD DISC RAM is a ROM. Features available are:

- No soldering or modifications to BBC micro necessary.
- Plugs into normal ROM socket fitting neatly under the keyboard allowing room for other add-ons.
- Easy to use. Comes with disk based software to SAVE and LOAD ROMs. Allows you to make backup copies of your ROMs.
- Disk software can be copied onto other discs when disc is full.
- All existing ROMs can be stored on disk and used in DISC RAM.
- No messy plugging and unplugging of your ROMs. Simply Load the one you want into DISC RAM.
- Ideal for Professional users to develop ROMs. Backup facility allows testing of final versions without using EPROMs.
- The switch provided allows backup and write protection to be switched off externally.
- Can also be used as 16K printer buffer RAM in conjunction with our Buffer & Backup ROM.

New Low Price: £30

P.S. 16K DISC RAM Board is not designed to work in conjunction with a Sideways ROM Board.

Versatile **BEEB SPEECH SYNTHESISER** Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32

Continued →



BOOKS (No VAT on Books)

21 Games for the BBC Micro	£5.95
30 Hour BASIC (BBC Micro)	£6.95
35 Education Programs for BBC	£6.95
100 Programs for BBC Micro	£6.95
6502 Assembly Language Program	£13.95
6502 Assembly Language Subroutines	£19.95
6502 Machine code for Humans	£7.95
68000 Assembly Lang. Programming	£19
A young persons guide to BBC Basic	£4.50
Advanced Machine Code Technique for BBC	£7.95
Advanced Programming for the BBC Micro	£6.95
Advanced User Guide for BBC Micro	£11.95
Advanced Graphics with BBC	£9.95
Advanced 6502 Programming	£12.45
Assembly Language Programming on BBC Micro	£7.95
Advanced Programming Techniques for the BBC Micro	£7.95
Applied Assembly Lang. for BBC	£7.95
Assembler Routines for the 6502	£
Assembly Language Programming FOR the BBC Micro	£8.95
Assembly Programming made Easy	£5.95
Basic ROM User Guide	£9.95
BBC BASIC for Beginners	£7.95
BBC BASIC	£5.95
BBC Forth	£7.50
BBC Hardware Projects	£8.95
BBC Machine Code Portfolio	£7.95
BBC MICRO add on guide	£6.95
BBC Micro An Expert Guide	£6.95
BBC Micro Assembly Language	£7.95
BBC Micro Book BASIC Sound & Graphics	£7.95
BBC Micro Games Master	£5.95
BBC Micro Graphics and Sound	£6.95
BBC Micro Programs in Basic	£5.95
BBC Micro ROM Book	£9.95
BBC Micro **ROM PAGING** System Explained	£2.00
BBC Micro Revealed	£6.95
BBC Micro Disc Companion	£7.95
BBC Micro in Education	£6.50
BBC User Guide	£10.00
BBC Wargaming	£8.95
Basic Programming on BBC Micro	£5.95
BCPL User Guide	£15
Brain teasers for BBC micro	£5.95
Business Applications on BBC	£7.95
Computing for All the Family	£6.45
CP/M Bible	£16.00
CP/M Handbook with MPM	£13.95
CP/M Soul of	£14.95
CP/M The software BUS	£8.95
Creative Animation & Graphics	£7.95
Creative graphics on BBC Micro	£7.50
DISC FILING SYSTEM (DFS) Operating Manual for BBC	£6.95
Disc Programming Techniques	£7.95
Disc System for the BBC	£6.95
Discover BBC Machine Code	£6.95
Discover FORTH	£13.95
Easy Programming for the BBC Micro	£5.95
Electron Machine Code for Beginners	£6.95
Exploiting BBC Basic	£6.95
Exploring FORTH	£6.95
Filing System & Databases	£7.95
Further Prog. for BBC Micro	£5.95
FORTH on the BBC Micro	£7.95
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Functional Forth for the BBC Micro	£5.95
Games BBC Computer Play	£6.95
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Hackers Handbook	£4.95
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Let your BBC teach u to program	£6.45
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The Epson FX/KAGA PRINTER Commands REVEALED	**£5.95**
Using Floppy Discs with BBC Micro	£5.95
Using BBC Basic	£6.95
Wordstar & CP/M made easy	£6.95

BEEB VIDEO DIGITISER

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROM's to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Features offered by this package include:

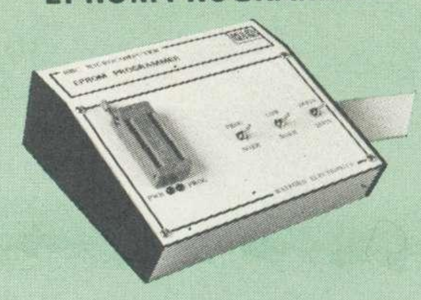
- The adding of pictures or written text to typed documents.
- Unattended recording of scientific data.
- Entry of real images into graphics programs.
- Generation of computer images.
- Slow scan television; sending images via a modem or radio.
- Security.
- Input from any video 1v video source.
- Full resolution in Modes 0,1 or 2.
- 1.6 seconds scan time.
- Up to 8 grey levels
- Manual or Auto level control
- Connects to user port

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£95 (Carr. £3)

(Price includes: Digitiser Unit, ROM & a comprehensive Manual.)

EPROM PROGRAMMER



The Watford Electronics' EPROM programmer for the BBC micro is a high quality self contained package. Programs all popular EPROMs from 2K to 16K: 2716, 2516, 2532, 2564, 2764 and 27128. All manufacturers' specifications have been followed to program EPROMs at the correct speed – wrong timings could destroy your EPROMs. The unit has its own power supply so does not put heavy loads on the BBC power supply as do some other units. Connects directly to the 1MHz bus following all Acorn recommendations on addressing and bus loadings.

SOFTWARE PACKAGE

The software is supplied on an EPROM which plugs into the Micro and is instantly available with a single command (no time wasting as on Cassette/disc loading). It is a fully purpose designed and ingegrated package to simplify ROM development. The system is menu driven with many prompts to avoid any accidents.

Software facilities include:

Load File – Save File – Down Load EPROM – Program EPROM – Verify – Blank Check – Editing of memory contents prior to programming.
Also included is an automatic system to allow Basic programs to be put in EPROM and accessed through the *ROM filing system. More than one program may be put in an EPROM. All these facilities and more are explained in the comprehensive and clear 15 page manual.

SPECIAL OFFER £69
(£3 carr.)

LOW COST 'DIN' EPROM PROGRAMMER

A high performance, low cost, self contained 'DIN' EPROM PROGRAMMER for the BBC Micro. Plugs into the BBC Micro's user port.

The features are:

- Will program 2716, 2732, 2532, 2764 & 27128 EPROMs.
- Copy Eprom into memory and compute checksum.
- Blank check EPROM.
- Program EPROM from memory.
- Verify programmed EPROM and display checksum.
- All * commands may be used from menu mode.
- High speed programming on 2764 & 27128.
- Machine code SOFTWARE supplied in ROM.

Only: **£49.50** (carr. £2)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs! The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28**
- **ERASER GT** – Deluxe version erases up to 28 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30**
- Spare UV tubes. **£9**

VOLTMACE JOYSTICKS

DELTA-14 JOYSTICK	£12
Adaptor Module	£12
Transfer Software	£7

ANTI GLARE MONITOR SAFETY SCREEN

HEADACHES? TIRED EYES? Don't take pills – Use a Watford Electronics anti-glare filter!
- Made in Britain by a long established glass maker.

Available in 12" & 14" versions – please specify the exact monitor type when ordering.

Special Price: **£13.00** (carr. £2)

SURGE PROTECTOR Plug

Fitted in place of your normal mains plug, this device protects your equipment against mains surges. Nearby lightning strikes, thermostats switching and many other sources put high voltage transient spikes on to the mains. This can lead to data corruption in memory and on disc and can result in spuriously crashing machines. A must for every computer user.

Protection for only **£9.50**

FLEXIBLE KEYBOARD CONNECTOR

A 'Keyboard to Micro' replacement jumper lead.

£4

ATTACHE CARRYING CASE for BBC Micro

The Attache carrying case is attractively finished in mottled antique brown leatherette. The case is made of tough plywood, providing a very solid and safe way to carry your BBC micro. There is room provided to fit all the leads necessary behind the computer and manuals in the front. Locks supplied with two keys. Price **£11** (£2 carr.)

DATA RECORDER

Top quality slimline portable cassette recorder designed specifically for use with home computers. Mains/Battery operated with tape counter.

£20

DATA CABLE to connect recorder to BBC **£2.00**

DATA CASSETTES

Top grade tested C12 Data cassettes supplied in library cases **35p** each; 10 for **£3.20.**

CONNECTING LEADS

(All ready made and tested)

CASSETTE LEADS 7 pin DIN Plug	
to 5 pin DIN Plug + 1 Jack Plug	£2.00
to 3 pin DIN Plug + 1 Jack Plug	£2.00
to 7 pin DIN Plug	£2.50
to 3 Jack Plugs	£2.00
6 pin DIN to 6 pin DIN Plug (RGB)	**£2.50**

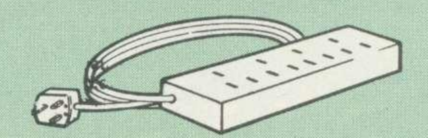
DISC DRIVE POWER LEADS

Supply from BBC power supply to standard Disc Drive connector.
Single **£3.00** Dual **£3.75**

MISCELLANEOUS CONNECTORS

	Plugs	Sockets
RGB (6 PIN DIN)	30p	45p
RS423 (5 pin Domino)	40p	50p
Cassette (7 pin DIN)	25p	65p
ECONET (5 pin DIN)	20p	30p
Paddles (15 pin 'D')	110p	215p
BBC Power Plug 6 way	80p	–
Disc Drive Plug 4 way	75p	–

4 WAY MAINS DISTRIBUTION SOCKET



4 way top quality mains trailing sockets. Supplied wired up with mains plug ready for use. Can be screwed to floor or wall if required. Very useful for tidying up all the mains leads from your peripherals. Allows the whole system to be switched on from one plug.

£9.99



CREDIT CARDS 24 HOUR HOT LINES
ACCESS 0923 50234
VISA 0923 33383

SPARES for BBC Micro

Keyboard	£46;	Keystrip	£2
Power Supply	£45;	Case	£25
UHF Modulator	£4;	Speaker	£2
Speaker Grill	£1;	Keyswitch	£2

28 pin ZIF SOCKET (Textool) **£6.95**

28pin DIL HEADER PLUG

SOLDER type	£1.50
IDC CRIMP type	£1.95

RIBBON CABLE

28way **55p/ft;** 34way **60p/ft.**

8way DIP SWITCH **£0.85**

CHIP SHOP

7438	40p;	74LS00	25p
74LS04	25p;	74LS10	25p
74LS123	80p;	74LS163	70p
74LS244	80p;	74LS245	£1
74LS393	£1.20;	4013	60p
4020	£0.90	4816	£1.00
DS3691	£3.50	DS88LS120	£3.00
LM324	£0.45	UPD7002	£4.40
6502A CPU	£5	65C02 CPU	£9.50
6522	£3.40	6845SP	£6.75
SAA5050	£8.75	SN76489	£5.50
2764-250nS	£2.25	27128-250nS	£3.25
6116LP-2K	£2.75	6264LP-8K	£4.75
8271	£45	ACORN DNFS	£15
ACORN OS 1.2	£6	ACORN BASIC 2	£16

ACORN LOGO **£60** COMAL **£43**
ISO PASCAL **£60**
SLEUTH ROM **£25** TOOLKIT ROM **£23**
BBC A to B Upgrade Kit **£45**

ROM EXTRACTION TOOL
£2

NEW LAUNCH

DELTA CARD

Delta is the latest in add-ons for the BBC Micro. Mounting internally, this unit provides a new CPU to run your programs at TWICE their original speed (i.e. a massive 4 MHz!). Even better than this, you can run applications programs such as Wordwise Plus, ViewSheet, Pascal, etc. at twice their speed. Whereas a 6502 Second Processor increases the speed of a standard BBC by about 50%, the combination of a BBC and Delta Card runs at twice the speed of a standard BBC! Unlike second processors, full compatibility is achieved with all standard software.

64k of fast RAM is provided on this card to allow for your program, Basic and the Operating System to all be stored in fast RAM, and hence run at maximum speed. Software available for this unique and powerful expansion card includes routines to load the currently selected language into the 16k of fast sideways RAM, alter the banking of the RAM to provide 'shadow' screen memory (as featured in our 32k RAM Card), provide a printer buffer, edit memory, etc.

Special Introductory Price
Only £99 (carr £3)

ALNOOR ARABIC ROM

Now available from stock, ARABIC ROM and Keytops for the BBC Micro. Please write in for further details.

ACORN SPEECH SYNTHESIZER

Speech Chips, Manual and full fitting instructions

Only £19

JOB VACANCY at Watford Electronics

Due to continued expansion at Watford Electronics, there now exists a vacancy for an experienced repair and test engineer to work in our workshops. The work is demanding and you should be capable of working under pressure.

Join the forefront of BBC technology with the hardware specialists for the BBC Micro.

There also exists a vacancy for a technical assistant. Applicants should be familiar with our range of products and have a reasonable command of written English.

Applicants to either jobs should send their CV to:
The Personnel Manager at Watford Electronics.

Prices subject to change without notice and available on request.
MAIL ORDER AND RETAIL SHOP TRADE AND EXPORT INQUIRIES WELCOME. GOVERNMENT AND EDUCATIONAL ESTABLISHMENTS OFFICIAL ORDERS ACCEPTED.
CARRIAGE: Minimum £1 on all cash orders. On bulky items, Securicor charge applies.
VAT: UK customers please add 15% VAT to the total cost incl. Carriage.
SHOP HOURS: 9.00am to 6.00pm. Monday to Saturday. (Ample Free Car Parking Spaces)

Watford Electronics

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PICTURES VIA VIDEO

Malcolm Banthorpe explains how you can manipulate video pictures, and reviews a £250 digitiser for the Beeb

VIDEO digitisers provide a way of converting a video picture from a camera or recording into a form which can be processed by a computer. The digitised picture will then be capable of being viewed on the computer's VDU and the picture data will be available for manipulation. The object of processing the picture may be to extract information; for instance, to check if anything has changed since the last picture was analysed or to calculate the area of a particular region of the picture. The image may also be altered by the software to get the best display: for example, to enhance the contrast or to suppress spurious detail. Processing and/or analysis of an image will, therefore, probably be the major reason for digitising it rather than simply to allow it to be stored on a computer disc or to be displayed on the computer screen or printer.

Most video signals start life in an analogue form (a continuously varying voltage) and need to be converted to a digital one so that they're accessible to a computer. The electronic circuitry needed for this purpose is an ADC (Analogue to Digital Converter), similar to that used in the analogue port of the BBC micro. However, the Beeb's ADC is not really fast enough to capture a video frame. As a single eight-bit conversion takes four milliseconds, it would take nearly three minutes to capture a picture of 160 by 256 pixels resolution – hence the need for additional hardware as well as suitable software to drive it. The hardware is also required to detect exactly when a particular video frame starts and when each horizontal line starts, by reference to the leading edges of the vertical and horizontal synchronising pulses in the video waveform.



This picture, taken by a black and white camera, has been processed by the micro

Applications of digitised pictures are now widespread, from the transmission of satellite weather pictures to the creation of graphic designs, from analysis of X-ray pictures to quality control and robot assembly lines in industry. They're even being used experimentally on a motorway to record the number-plates of moving cars and check for stolen vehicles.

One of simplest video digitisers is the Micro-Robotics EV1 camera which was reviewed in March '85. This operates in a slightly different way from most other digitisers in that it does not accept a standard video signal but employs its own miniature solid-state camera to generate a two-level digital signal which can be read directly by the computer's user port. At the other end of the price scale (and at £200,000 well beyond the realms of home computing) are a number of digital video effects units used in television production which will digitise a moving broadcast-quality colour picture, allow it to be moved, squeezed, zoomed or rotated, and then convert it back to its analogue form in real time.

At a personal computer level, now that video cassette machines and video cameras are becoming increasingly common, there are a number of possible uses for a digitiser, apart from just producing the inevitable computer portraits which still seem to fascinate a lot of people at exhibitions. Since a picture can be captured, modified, used as a background for text and re-recorded on a VCR, it should be feasible to

Top row KX1203, K12SV3, KX1201. Bottom row K12R3, K12R2. Optional 'tilt and swivel' stand shown with certain models.

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generate interesting title sequences for home-made videos. Then there's the possibility of using digitised pictures as the background to games. More seriously, a digitiser could provide the means to explore computer vision, pattern recognition and allied artificial intelligence topics. Back on a simpler level, if you need a picture of a map on the screen, digitising a suitable picture to obtain the outline and then filling in the details with a simple drawing program would be a lot quicker than drawing it directly, and (of course) accurately, to the screen.

There are a number of digitisers available which can be used with the BBC micro. Some are designed to operate with a range of computers, though the one I'll be looking at in this article is made specifically for the Beeb. In a future issue I'll look at some of the alternative units.

The RH Electronics Digitiser comes with its own power supply in a cream-coloured case, similar to those which house second processors and teletext units. Software is in ROM and a 14-page manual is also included. The software supplied with the basic package will allow pictures to be digitised in any of the graphics modes, to be stored on disc and to be dumped to an Epson (or Epson-compatible) printer.

The software is a language ROM but, as it needs to address the screen directly, is not relocatable in a 6502 second processor. Four special OSWORD calls will, however, allow pictures to be digitised under the control of a second processor or from another language: for instance, the user's own Basic program.

The digitiser connects to the 1MHz bus of the computer (a cable is supplied) and is claimed to conform to all 1MHz bus standards – allowing several other pieces of equipment to be connected to the bus at the same time.

The back of the unit has a video input socket and two more video sockets. These give you the option of allowing the computer and the video source (camera, VCR, etc) to share a common composite video monitor, ie, a monitor that is normally connected to the Video Out socket on the computer – but not an ordinary television set or an RGB monitor. Switching the display between the computer output and the video source is then under software control.

*VIDEO accesses the ROM and displays the main system menu which has options selected by using the function keys. Any of the graphics modes can be selected, although the ROM is set by default to operate in mode 2. The horizontal resolution of the pictures is always 160, the vertical resolution is either 128 or 256 depending on the screen mode chosen. The mode selected will determine how the image is displayed on screen. Mode 2 gives a picture in eight levels of grey, represented by eight displayable colours. Mode 1 also shows eight levels of grey but as there are only four colours available, this is achieved by including four pixel patterns as well as solid colours. Mode 0 achieves eight grey levels purely through the use of pixel patterns.

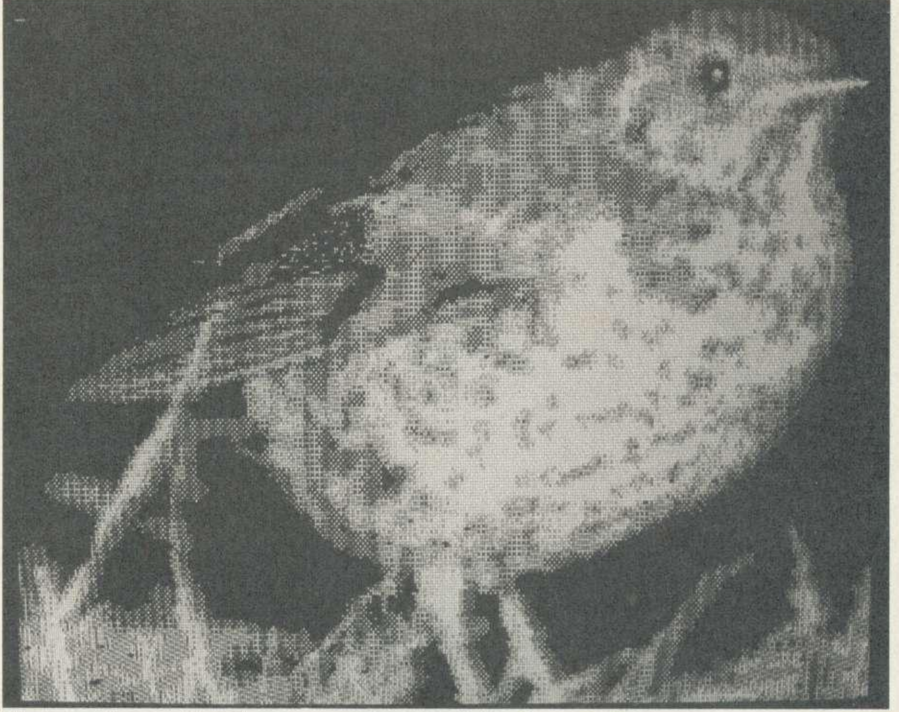
As the colours displayed are not related to the actual colours of the original source picture but to its luminance levels, mode 1, 2 and 5 pictures are, on the whole, best viewed on a monochrome monitor. The colours have been chosen to match the grey levels as closely as possible.

Either a colour or black and white camera or a VCR can be used as the picture source, as long as they can provide a composite video signal, such as is available from the Video Out socket on most VCRs. Analogue to digital converters fast enough to digitise a complete video frame in real time (1/25th of a second) are still very expensive, so the picture is scanned vertically in 160 strips, each strip taking either 1/25th or 1/50th of a second, depending on the operating mode of the digitiser. Since it takes several seconds to digitise a complete picture, it will generally be necessary for a VCR to provide a reasonably steady still frame – the one I tried was suffering from worn heads and the resulting instability produced very variable results. Most VCRs have a noise bar in the picture when frozen. As it usually only appears on one of the two interlaced fields (displayed each 1/25th of a second to make up one complete television frame), the software allows either field 1, or field 2, or the complete frame to be selected for digitising, so that the noise bar can be eliminated when necessary.

I found that the best results were obtained either with a monochrome picture source or one that didn't contain too much colour. Saturated colours in the source picture tended to cause patterning on the digitised picture; it appears that the colour subcarrier component of the video signal had been digitised. A subcarrier filter could be built simply and cheaply (a single capacitor might do the trick) and should perhaps be included in the unit.

To store a picture comparable in quality to a broadcast television picture would need about one million bytes of memory. Such a screen image would also require four times the horizontal resolution available in mode 2, twice the vertical resolution and about 256 grey levels. Anything less will risk the loss of some detail although, depending on the nature of the image, it may still be able to provide all the information required for analysis and provide an acceptable image for viewing. The brain has a remarkable capacity for filling in missing detail on pictures of familiar objects; very low resolution portraits are still recognisable as being of a particular person.

The A to D converter in the unit actually analyses the source picture into 256 levels, but only eight, at the most, can be stored or displayed simul-



The better the quality of the source picture, the better the results

75

taneously by the computer. If the object is to produce an image for display or printing it's beneficial to choose the pictures to be digitised very carefully to get the best results. With a camera it may be possible to adjust the lens aperture or signal level for optimum distribution of the grey levels. The signal from a VCR will usually be fixed but there are two controls at the back of the digitiser which will allow the black and white levels to be adjusted. These controls are in the form of multi-turn potentiometers and, as recommended in the manual, it's highly desirable to count the turns when adjustment is made so that the manufacturer's settings for a standard 1 volt video signal can be restored. The pictures which accompany this article were digitised from a black and white camera.

Once an image has been captured and stored, it's available for analysis and modification. So, for the purposes of graphics and graphic design, a stored picture could be loaded into a painting program for enhancement.



The best results are obtained from a source that doesn't contain too much colour

Image analysis will require some extra software, either written by the user or as in the *Image Processor ROM* supplied separately by RH Electronics – it also includes the facilities of the ROM supplied with the basic package.

The image processing functions are all designed to be used with mode 2 pictures and (briefly) are as follows:

● Boundary analysis – shows up the points on the image where the intensity changes as a series of white contours. Three threshold levels can be selected so that contours are drawn at all boundaries, at alternate boundaries, or at every fourth level.

● Area calculation – a cross-hair cursor is moved by the cursor control keys. On pressing Copy the area of pixels the same as at the current cursor position is calculated.

● Compressed save and load – it normally take 20k of disc space to store a singe mode 2 screen. By using the technique known as 'run length coding' the storage space is reduced by about half, depending on the picture.

● Binary scan – on selection of a cutoff level, everything above the cutoff is displayed as white, everything else as black.

● Distance measurement – the cursor is moved with the cursor control keys to indicate two points on the image. The software calculates the distance between these points.

● Noise filter – scans the image and removes any isolated pixels which are completely surrounded by pixels of one other colour. Helpful in cleaning up pictures from a noisy VCR recording. Can also further reduce the storage space required for a compressed picture.

● Pixel editor – a simple way of modifying the image, one pixel at a time, using the cursor keys and a cross-hair cursor.

● User command – allows access to '*' commands and so allows access to non-standard screen-dumps, etc.

Further disc-based utilities supplied with the *Image Processor ROM* include a commented assembler listing of the basic digitising routine and the manual contains notes on the hardware operation of the digitiser. This will allow some users to customise the software for their own purposes: for instance, the eight levels out of 256 displayed by the ROM software are fixed. It should be possible with the aid of this listing to write a routine to select any eight levels, or by defining more dot patterns to display more than eight levels.



Printer dump of two pictures together, courtesy of the Image Processor ROM

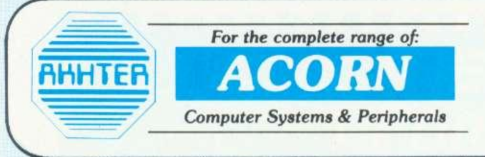
At £250 the digitiser is probably out of the price range of those who'd just like to make the occasional computer portrait, but for those with a serious interest in image processing and analysis or possibly in graphic design, it offers a useful tool.

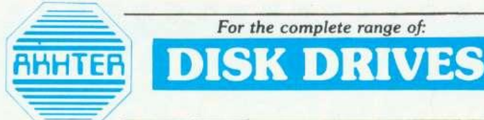
The image quality is limited mainly by the display capability of the computer, and within these limits the RH Digitiser seems to digitise any source faithfully.

Despite the restricted resolution, the better the quality of the source picture, the better the results. The menu-driven software is very straightforward to use, with no apparent bugs, and requires no technical or programming knowledge. The *Image Processor ROM* contains some fairly sophisticated facilities – those with a particular interest in this area may want to go even further and write their own software. The assembler listing and technical notes should be helpful in this and could perhaps be included with the basic package.

Video Digitiser £250 inc VAT
Image Processor ROM £49.95 inc VAT

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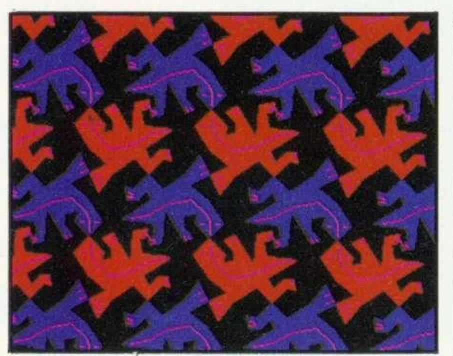
SHAPE UP WITH TESSELATIONS

Jim McGregor and Alan Watt explain what these jigsaw-like patterns are and how to produce them

PEOPLE have always been fascinated by shapes or tiles that fit together to cover a surface plane leaving no gaps between the tiles. Shapes having this property are known as tesselations, and the process of dividing up a plane into equal figures in this way, without gaps or overlaps, is known as 'tesselating'.

Last month's article dealt with symmetry and the programming required to place a motif at certain positions in a plane. Mathematically there is no difference at all between the symmetry groupings of network patterns that do not tesselate and those that do. However, the programming for each requires a completely different approach.

You can change the appearance of tesselation patterns by altering the number of colours used. The flying fish tesselation on the left uses three colours and that on the right four colours





These lizard tesselations also use four colours and VDU19 changes, but the lizard is rotated too. You'll need the book to produce these lizards

Any single equilateral triangle can be used to tesselate the plane, as can any square or any regular hexagon. The plane cannot be tesselated by regular pentagons, but there are a number of irregular pentagons that will. Such an example is the well-known Cairo tile, shown opposite, so-called because many of the streets of Cairo were paved in this pattern. The Cairo tile is equilateral but not regular because its angles are not all the same.

The work of M C Escher is well known in this area. Many of his pictures involved tilings of the plane with shapes that resembled animals and birds. In some of his works a single shape was used whereas, in others, he used a combination.

One well-known picture involves a group of 12 different bird shapes that can be repeated to tesselate.

Many traditional decorations and crafts involve tesselations. A common example is in patchwork design where pieces of fabric are sewn together to create attractive patterns. These patterns are often used as single motifs on cushions, or they can be combined for use on larger objects such as bedspreads. Tesselations are also widely used in floor and wall decorations.

Tile deformations

A fascinating area for experimentation is the generation of unusual shapes that will tesselate. If the shapes resemble animals or birds, you can decorate them with lines to draw attention to this resemblance. (Two very simple shapes, a cat's head and a whale, are illustrated on page 84.)

Before looking at ways of decorating and colouring these shapes we will examine programming techniques for generating the unusual shapes that will tesselate.

Any shape or set of shapes that will tesselate can be deformed into a new set of shapes that will also tesselate. The basic process that you can use is to replace an edge in one of the shapes by two lines at an angle that connect the two endpoints of the original edge. Whenever this is done, a matching deformation must be carried out on any edge that could meet the deformed edge in a tesselation. In the example shown opposite, successive deformations are applied to a square that tesselates by simple translation in the x and y directions. After a few deformations, the shape resembles a cat's head.

Simple tile deformations

Now consider an introductory program (listing 1) that can be used to experiment with simple tile deformations of the type just described. It limits you to a single shape that can be tiled by translating it in the x and y directions, like the square that was used earlier.

The structure of the initial shape and details of the translations needed to tesselate it are contained in DATA statements at the end of the program. A detailed explanation of these are given in McGregor & Watt's book, *The Art of Microcomputer Graphics for the BBC Micro/Electron.* So, let's have a look at the first program.

When deforming a shape, the program uses a variation on the technique of rubber-banding described in Chapter two of the book. The shape that is being deformed is displayed on the screen and a cross marks a point on the circumference of the shape – call this point the 'current point'. You can move the cross round the circumference of the shape, either clockwise or anti-clockwise, under keyboard control (key C is used for clockwise movement and A for anti-clockwise movement). Holding down a key results in repetitions of the key and the length of time a movement key is held down determines the amount of movement. As well as the main cross there is a smaller cross that marks the opposite point that will meet copies of the current point when the shape tesselates.

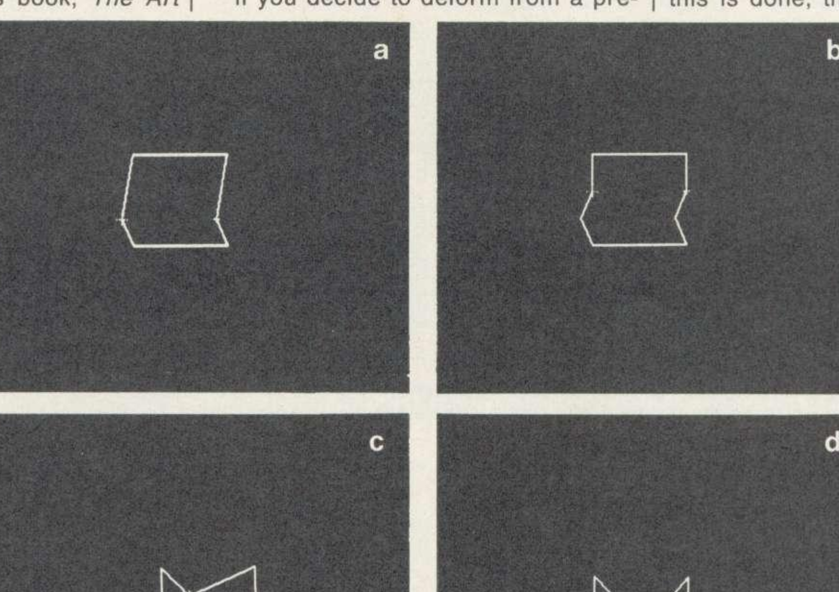
At any stage, you can opt to deform the tile at the current point (using key D). When you want to deform the shape at a point on an edge, a new vertex is created and the program switches to rubber-banding mode. The new vertex can be moved about the screen using the cursor arrows. Lines connecting it to the endpoints of the line that has just been broken are maintained by rubber-banding. While this is happening, the program will automatically deform the side opposite in exactly the same way so that the shape's tesselation properties are maintained.

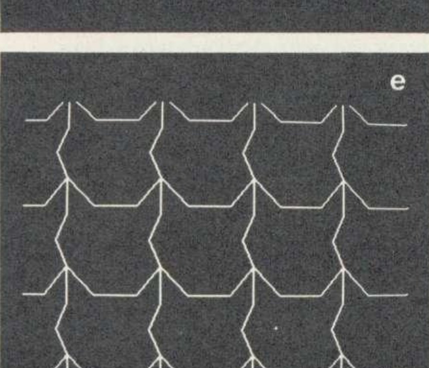
When the deformation is complete, fix the vertex that has been dragged (using key F) and the program automatically fixes the opposite vertex.

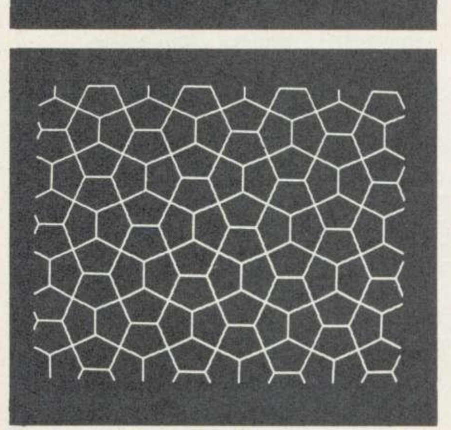
If you decide to deform from a previously created vertex, it's very straightforward. Rubber-banding carries on from where it left off when the vertex was previously fixed.

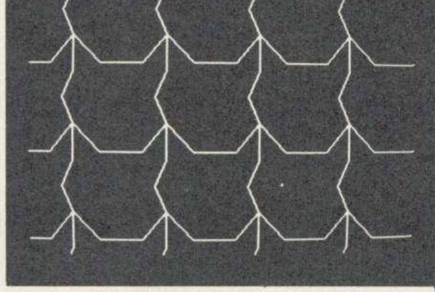
However, the original vertices of the shape are regarded as permanently fixed and the shape cannot be deformed by dragging these – doing so may result in the shape not tesselating properly. You can, of course, create and move new vertices as many times as you like. In the case of the square, copies of four different corners of our initial square meet at each vertex in a complete tesselation.

Another option that is available to you while in the main command mode (ie, when the program is not in rubber-banding mode) is to request a tesselation of the screen to see how the shape will look (key T for Tesselate). When this is done, the program requests a scale factor to be used in drawing the shapes during the tiling process. This enables tilings to be tried with large or small copies of the basic shape. After tesselation has occurred, key T can be pressed again and, as before, the program will request a scale factor.









Five stages (a-e) in the construction of a cat's head tesselation

The Cairo tile is a pentagon that tesselates. It is equilateral but not regular

Alternatively, key P (for Planning) can be pressed and the single shape will be re-displayed on the screen. By using keys A, C, D and all four arrow keys, further deformations can be made.

As yet another example of our initialising DATA statements, we can give the square a somewhat more elaborate structure in preparation for the generation of the 'flying fish' illustrated on page 82. Listing 2 gives the DATA statements required to describe this shape and its tesselation pattern. The creation of this pattern is more fully explained in McGregor & Watt's book.

Colouring and decorating tiles

Many of the tesselations illustrated so far have included tiles filled with contrasting colours and decorated with lines that enhance our interpretation of the tile as an animal or fish – here are ways of extending the tile design program to include this colour filling and decoration.

A colour fill algorithm

Provided each tile is a convex shape, it can be easily broken up into a set of triangles for colour fill. (A convex shape

is one that bulges outwards everywhere and has no bays.) However, the shapes generated by our tile deformation program are not necessarily convex. They tend to have recesses in the boundary that would cause areas outside the boundary to be filled if we used such a simple approach.

Filling an arbitrary polygon with colour is quite a tricky operation. One way of doing this would be to draw the shape and use one of the flood-fill algorithms described in the book. However, if a flood-fill algorithm were used for every second tile drawn in a tesselation, the process would be unacceptably slow.

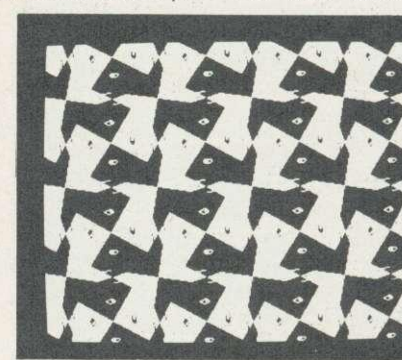
Triangle fill operations are very much faster and it's possible to break down an arbitrary polygon into a set of triangles that can be filled. The book describes this technique in much greater detail, but let's look at its application.

Listing 1 can easily be extended to use a procedure that finds a sequence of triangle fill operations. The alterations needed are presented as listing 3. PROCcolourfill is called from the main command loop of the program in response to command key F. On pressing this key, the tile will be filled. You can see in the example above how a tile resembling a cat's head looks during this process. The tesselation is displayed in a black and white checkerboard pattern, also shown on this page.

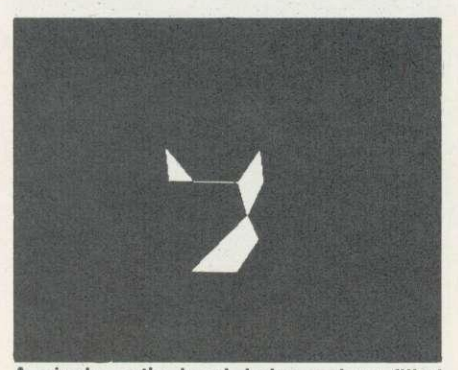
The algorithm implemented by PROCcolourfill works its way round and round the boundary, searching for triangles that can be filled. When such a triangle is found and filled, the boundary is shrunk to exclude the newly filled triangle. The process continues until the boundary has shrunk to only two points, which means that the original shape has been completely filled.

Adding tile decorations

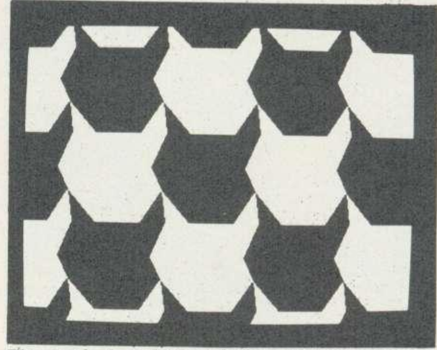
The final program alteration that's presented (listing 4) is the inclusion of a procedure PROClinedraw. This is called from the main command loop in response to command key L. When you press this, a small cross appears. Think of this cross as the point of a pencil that you can use to draw on the shape. The arrow keys are used to move the cross to where you want to start drawing. Pressing F, followed by O (on/off) puts the 'point' onto the surface. The arrow keys can then be used to move the point, to draw a line. When the line is drawn F is pressed to fix it. A new line can be drawn from the end of the fixed line by repeating the instructions. If you wish to start a separate line, O must be pressed and the cross moved to the new position. F is then pressed, followed by O, and drawing will continue as before. To finish, P must be pressed. Don't worry that if on colour filling the tile, the lines become obscured. Pressing P will reveal them again, or, alternatively, pressing T will tesselate the tile and any decoration lines will be drawn in inverse colour. You will find examples of the cat's head in the process of being decorated and a tesselation on completion of the decoration shown on this page.



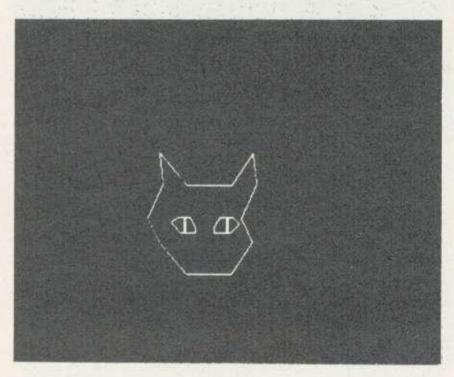
These two simple Escher-like tesselations show how you can generate unusual shapes that will tesselate. By decorating them with details you can make them look like animals



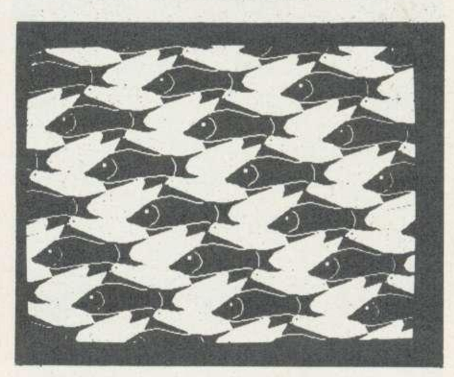
A single cat's head being colour filled using listing 3 from the yellow pages



The cat's head tesselation displayed as a black and white checkerboard pattern



A tesselation in the process of being decorated to look like a cat's head



This two tile tesselation of fish and birds shows how a pair of shapes can be used

Variations

The tesselation of a whale-like shape you can see on this page could not be produced by the program as developed so far. The whale is not only translated in the tesselation, but is also displayed in different orientations. To design such a tile, the design program would have to be extended to handle the rotations involved.

Such extensions are used to produce the lizard tesselations on page 82. A

SOURCES

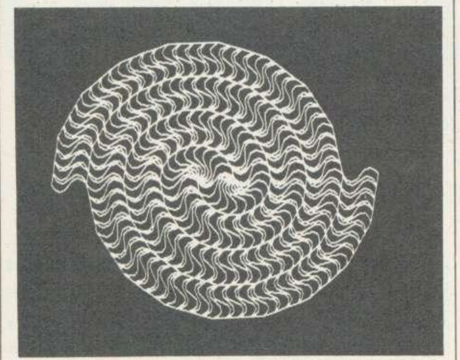
The Art of Microcomputer Graphics for the BBC Micro/Electron, McGregor and Watt, Addison-Wesley, £14.95

Tesselator, Hallam, Addison-Wesley, cassette: £21.95 inc VAT, disc: £27.95 inc VAT.

Graphito, Hallam, Addison-Wesley, cassette: £22.95 inc VAT, disc: £29.95 inc VAT.

much fuller discussion of this process is given in the book. The *Tesselator* software package by the same authors implements many tesselations of this type.

The bird and fish illustration (opposite) shows a simple example of a pair of shapes that, together, tesselate the plane. To handle this, our data structure would need to be extended to contain information about two (or any number of) shapes, each with their own vertices, lines and connectivity information.



A tesselation involving rotations based on a deformed isosceles triangle

As a final example of further possibilities, the illustration on this page demonstrates another type of tesselation layout involving rotations. The basic patterns were built up with copies of an isosceles triangle in different orientations.

This article is the second in a series of four adapted by Stephen Maddock from *The Art of Microcomputer Graphics for the BBC Micro/Electron.* The book, by Jim McGregor and Alan Watt, is published by Addison-Wesley Publishers Ltd.

McGregor and Watt's tesselation listings are on yellow pages 108-110

ARTFUL MANIPULATIONS

Bring out the artist in you with Chris Steele's enhancements to his Freehand painting system

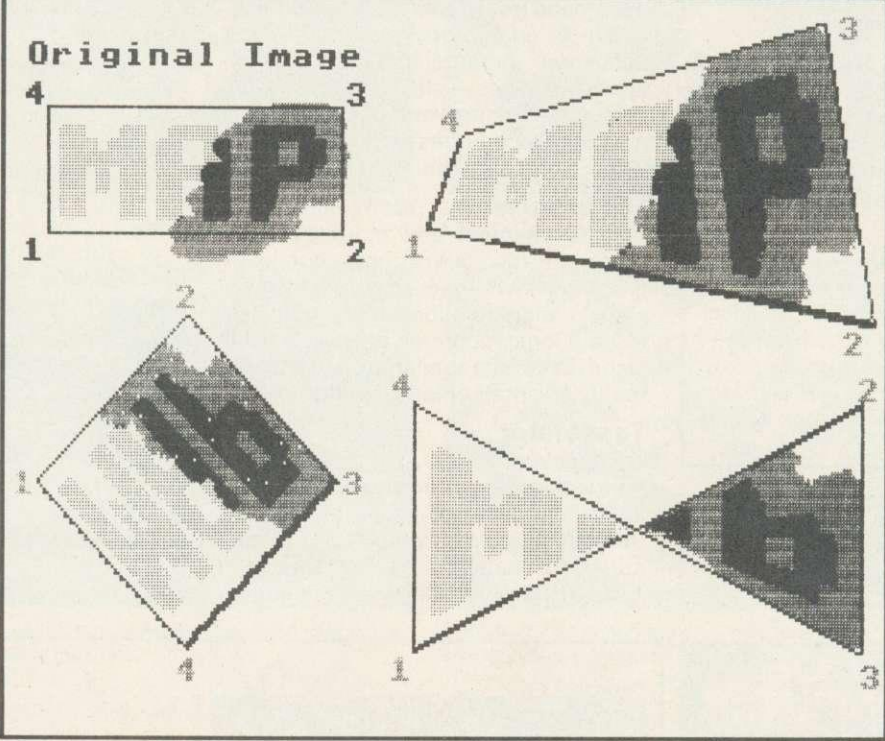
LAST month I introduced the basic painting system *Freehand*. The structure was provided in the listings, along with a number of simple paintbrush routines, allowing you to make marks on the screen.

This month the system is extended with a series of disc overlays which allow you to perform sophisticated image manipulation. (Don't despair if you do not have a disc system, as the procedures presented here can be lifted from the overall program and inserted in your own software.)

All of these new overlay routines can be accessed using function keys f3 to f9 in conjunction with the Shift and Control keys. First, amend the main program that was printed last month. It is the final few lines (2160 to 2380) which deal with the disc overlays and for clarity, these are reproduced again. Check them all against last month's listing. Then type in each of the separate routines and save them in directory O for Overlay, under the name printed in the REM at the start of each routine.

The routines are of two sorts. First, those loaded with the Shift button provide further ways of putting colour on the screen.

The second set, accessed using the Control key, provide ways of manipulating and controlling what is already on the screen.



Using the mapping function you can reduce, enlarge, mirror, reverse and twist an image

Plotting tools (Shift + f3 to f9)

f3 Airbrush There are many different ways of implementing an airbrush on a system like this: this is one of the simplest and quickest. After loading, a flashing square is presented which represents the area that the airbrush will spread paint over and you can make it larger or smaller using the cursor controls. Now a figure for the density is presented in the prompt box; again it can be increased and decreased using the cursor control keys. This is the number of pixels which will be set every time you press the trigger. Now 'Hit' (by pressing the fire button or the space bar) and then move the cursor and use the airbrush.

f4 Hatch This routine allows you to hatch (shade with parallel lines) a rectangular area. Move the cursor to the lower left corner of the area to be hatched, hit, then move to the upper right and hit. A sequence of colour numbers is now required for use in the hatching. The sequence 01, for example, will give a chequerboard of alternating pixels in colours 0 and 1. The sequence can be very long, allowing quite varied effects. Finally, you can choose (R) right-handed, or (L) left-handed hatching. In right-handed the lines go from SW to NE, whereas in left-handed they go from NW to SE.

f5 Text This option allows you to plot text on the screen in one of three styles and with a number of magnifications. First, type in the text. Now a number for the X and Y magnification. A magnification of 1 will give standard mode 1 text, a factor of 2 will be twice that size. In emphasised mode the text is plotted twice, the second image being slightly

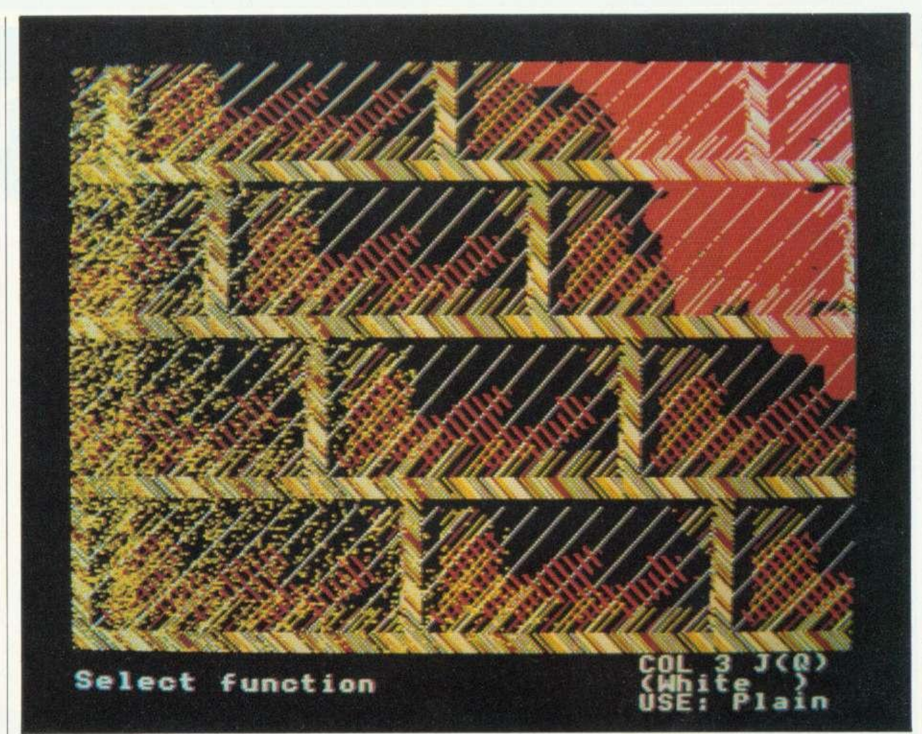
displaced from the first, giving a more rounded character. Outline text is plotted quite large: the centres of each character are then re-plotted in the background colour. Selecting neither option will produce the standard character set. Now move the rectangular area to the position on the screen you want the text plotted, and hit.

f6 Pattern Fill This is a fill routine with a difference. It will fill any totally bounded area of the screen with a chosen line of pixels. This is the first thing to be entered; if you want the whole area to be filled with just one colour, just select that colour number. If you want to fill it with a pattern, define it with a series of colour numbers, as was done in the hatching example. You can also select an offset for each subsequent line. As an example: if you type 13 for the pattern, and 1 for the offset, it will fill the area with alternating pixels of colours 1 and 3. Don't try to fill the area with a pattern that includes the colour 0, or the routine will try (and fail) to fill the area repeatedly.

f7 Trace This is very useful for highlighting an area, or making an image stand out from its background; it allows you to trace around an image of one colour with a line of another colour. First type in the colour of the image to be traced, and then move the cursor to the edge of the shape. It works best if you select an area which includes a little of the left-hand edge of the shape. The traced line will be drawn in the presently selected plotting colour (shown in the prompt box).

f8 Calligraphic This function produces an effect like a calligraphy pen. First the size and angle of the pen must be set: move the end of the flashing line until it is at the correct width and angle for the pen, then hit. Now choose a sequence of colours, in the same way as for the hatching routine. Now when you move the cursor, while the hit button is held down, thick, angled and striped lines will be drawn. Producing a satisfactory result takes practice, but is worth the effort.

f9 User This is a dummy routine which does nothing: you can insert your own favourite routines here, or try out new ideas. Because all the I/O routines are already present it is easy to concentrate on a particular function without getting wrapped up in all the extra code needed to test a graphic routine.



The wallpaper option in action, with a 30 per cent shift in the horizontal and vertical



Some of the ways you can manipulate images using the Freehand program

Manipulative tools (CTRL + f3 to f9)

f3 Pixel averaging Pixel averaging was initially intended as a simple way of implementing anti-aliasing, which is a technique used to hide the jagged edges of computer graphics. It does this by providing an edge which would go from black to white through a series of greys. Each pixel becomes the numerical value of the average of all the pixels around it. On a monochrome monitor the curves are smoothed-out – on a colour one it produces quite an interesting result! Try tweeking the 'fudge factor' of 0.5 in line 10420 to make the transformation act in slightly different ways.

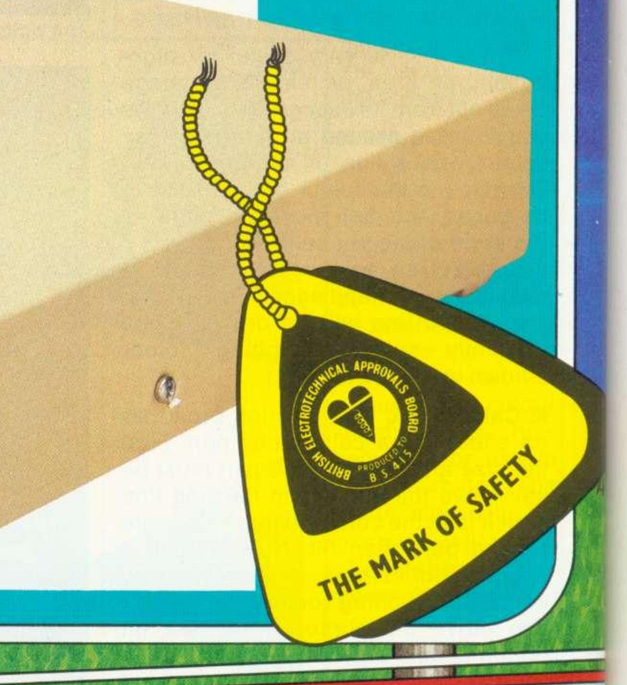
f4 Map This provides a general-purpose pixel mapping routine. It's not easy to explain: however, the routine works upon a four sided figure (see 'original image' in the illustration opposite). Point to the four corners of the origin shape in turn, and then to the four corners of the destination shape. The routine will stretch and squash the image bounded by the origin shape to make it fit within the destination shape. Take a look at the examples in the illus-

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Telex: 859380



tration. The routine is a little slow, but it does allow graphics to be manipulated in a very flexible manner: it's possible to reduce, enlarge, mirror, reverse and twist. Remember that the four points of each shape can be anywhere on the screen. Try using it with a square origin shape, and a triangular destination shape (two of the points on top of each other). You could also try putting the destination shape inside the origin shape. This routine is a little too flexible for many simple tasks so a number of other routines (f5 to f8) are presented to perform the more specific tasks.

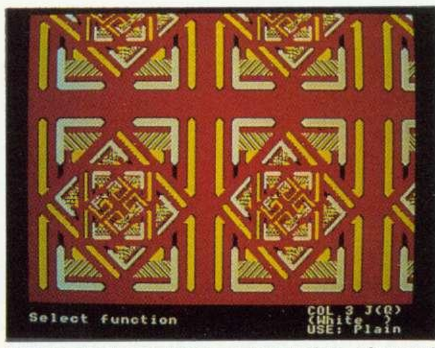
f5 Copy This routine is useful for either repeating an image several times or for moving it to a different location on the screen. Locate the lower left and upper right corners of the rectangular area to be copied, then answer N to the question 'Change copy colour attributes?'. You can then reposition the outlined rectangle and copy the image to any area on the screen. If you answer 'Y' you can alter the colours of the image when it is copied. The routine steps through each colour in turn asking first for the use (see page 262 in the User Manual which explains the logical operators OR, AND, etc), and then the colour which is to replace this colour. For example: if you answer the question 'Use of colour 0' with a 0 and 'Colour to replace colour 0' with a 2, all the background pixels in the original image will be set to colour 2 in the copied version. Careful selection of these variables will allow you to copy images on top of each other, or to extract an image from its background.

f6 Wallpaper This is another copying routine, developed to allow the easy generation of complex repeat-pattern backgrounds. Define the area to be copied as before, then decide how you want it to be repeated over the screen. You can select N for no shift, where the copies of the image are in straight rows and columns. Choosing V for Vertical shift will make each column of images lower than the one to its left (as wallpaper patterns often are). Select H for Horizontal shift, and each row will be shifted (like bricks in a wall). You can enter the percentage shift if you select H or V. See the picture of the wall on page 87 for an example of all three, with 30 per cent shift in the horizontal and vertical examples.

f7 Areas This is another copy routine, but one which will copy a rectangular area of the screen to a file. It allows you to transport elements from one picture to another. No compression techniques are used, and each pixel is stored as a whole byte, so keep the areas small.

f8 Squash This is another derivative of Map, and one which I find most useful. It allows you to map or copy one rectangular area to any other rectangular area, meaning that it's easy to stretch or squash in just the x or y axes. Select a rectangular area of the screen in the usual way. Now choose the lower left corner of the destination area. A diagonal will appear along with the rest of the box – you can move the upper right corner until the destination box is in the proportions you want. If the upper right corner lies on the diagonal you'll be sure that the destination image is the same proportion as the original image. The tick marks on the diagonal represent 50%, 100%, 150%, and 200% of the original image size. Recursion can be achieved very easily by locating the destination area within the original area.

f9 Dump This function key is reserved for a printer or plotter dump routine. Replace the present listing with a suitable mode 1 graphics dump for your own printer. If possible, the dump routine should not dump the bottom three lines of the screen, as the text messages appear here. For those who own a Kaga Taxan 910, the listing on the yellow pages will produce very large printer dumps on A2 paper.



Many designs have a recursive element and this can be achieved with 'squash'

Development

The advantage a painting system like this has over a commercial system is that you can adapt *Freehand* to your own requirements. Do not be satisfied with the system as you find it. Use and experiment with it until you have some idea of which functions are most useful. Add functions which you have developed, or those which might be available on graphics chips in your own machine. As with all software, this system should perform the tasks that you want, in the way that you want.

The listings for Chris Steele's enhancements to his Freehand program are on yellow pages 111-117.

	f0	f1	f2	f3	f4	f5	f6	f7	f8	f9
CONTROL	SAVE	*O.S.	LOAD	PIXAV	MAP	COPY	WPAPER	AREAS	SQUASH	DUMP
SHIFT	POSE	DEF COL	DEF GRID	AIR BR	HATCH	TEXT	PATFILL	TRACE	CALIG	USER
	COL 0	COL 1	COL 2	COL 3	COL USE	BR 0-3	BBR 0-3	BAND	JOY/KEY	CLR SCR

Function keystrip for use with Freehand – either cut it out or trace it

CONVERSATION

YOU could win an Electron with a Plus 1 and Plus 3 in this month's competition – we've got over £800-worth of prizes to give away.

All you have to do is invent a conversation between two characters. It can be funny, sad, shocking – but it must be something to fire the imagination of our judges.

The idea is based on *Talkback*, an educational game from Acornsoft. Playing the game might help you with ideas (and we've given you a couple of examples opposite) but it's your skill which will win in the end.

With *Talkback* you can actually create a couple of characters who speak together on the screen, and will chat with you too. First you prepare what each character might say, then you try out the conversation. Every conversation is different and your characters will produce surprising and amusing results.

What you have to do

1. Think of two original characters with interesting things to say to each other.

2. Give each character a name (up to seven letters long).

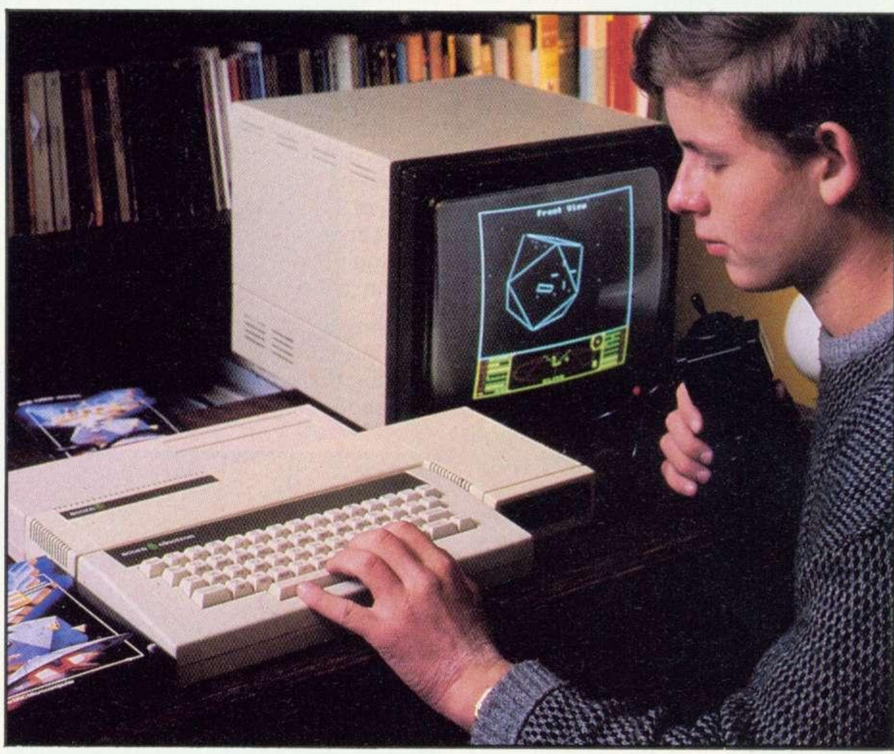
3. Briefly describe an incident (up to 50 words long) which would cause the two of them to strike up a conversation.

4. Include a few lines of dialogue (up to eight lines each) to show the sort of things they would say.

5. Send your entry (including your name and address) and the coupon below to: Talkback Competition, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH, to arrive not later than 22 November 1985. Entries submitted without an accompanying coupon will not be considered.

The winner, to be selected by a panel of judges from Acornsoft and *Acorn User*, will receive an Electron with a Plus 1, Plus 3 and *Talkback*. Three runners-up will each receive an Electron and *Talkback*.

ACORN USER COMPETITION NOVEMBER



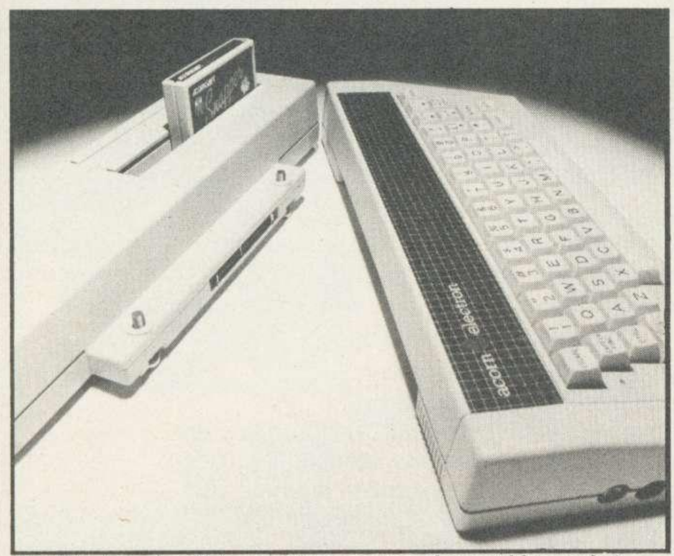
First prize in this month's competition is an Electron with Plus 1 and Plus 3 (pictured above), and a *Talkback* game – total value over £400



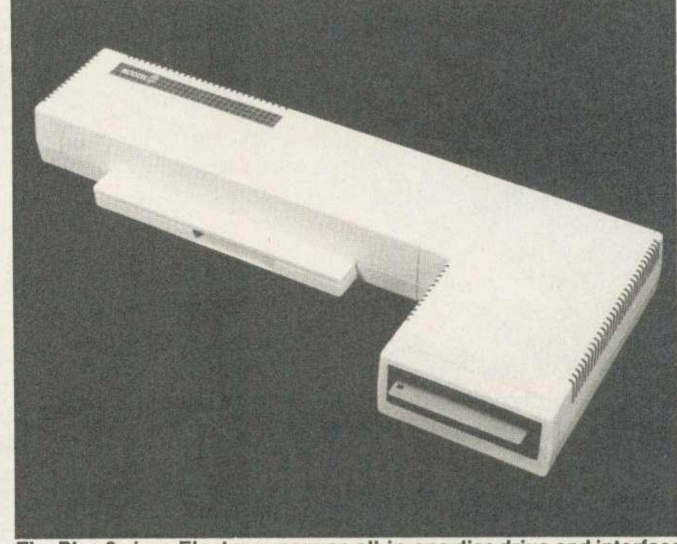
***Talkback* from Acornsoft is a conversational game based on 'starters', keywords and responses. You create the characters and define their personalities**

PIECE

Prove that the art of conversation is not dead by creating an original dialogue–and win yourself an Electron



The Plus 1 has joystick and printer ports and a cartridge socket


The Plus 3 gives Electron users an all-in-one disc drive and interface

Example One

Characters: Neville and Flo

Incident: Lonely, suburban, housewife Flo Chart daydreams over the washing-up. Suddenly a submarine surfaces in the sink. Its Captain greets Flo with oily friendliness.

Dialogue:

Neville:	Ahoy there young lady
Flo:	Who are you?
Neville:	Neville Officer, madam, a naval officer
Flo:	Are all your navy's boats so small?
Neville:	Certainly, it's the Sardinian navy
Flo:	I thought there was something fishy about this
Neville:	I'm lost. Can you direct me to Scarpa Flow?
Flo:	I suggest you scarper
Neville:	Right ho. We'll go back at full speed
Flo:	You have such a stern expression
Neville:	This is a good place to put a submarine base in
Flo:	Yachts have basins
Neville:	And a submarine sinks

Example Two

Characters: Visitor and Voice

Incident: ET establishes contact with fellow beings from its home planet. Its timid, gentle nature proves no defence against the tasteless humour of the voice at the other end of the line.

Dialogue:

ET:	Must 'phone home
Voice:	Receiving you. Are there any humans near you?
ET:	Ouch
Voice:	They sound painfully close
ET:	No, they've gone to school. It's a place where they go to learn
Voice:	And where do they go when they've learnt about school?
ET:	They go home. I want to go home
Voice:	Go to school first then
ET:	That's not very funny. How would you feel with millions of humans all around you?
Voice:	Surrounded. I suppose you'd better report some observations
ET:	The only time I've been out I had a sheet over my head
Voice:	Well, I wouldn't want to be seen out with humans either
ET:	Oh . . . come and rescue me!
Voice:	Sorry, this is not a collect call

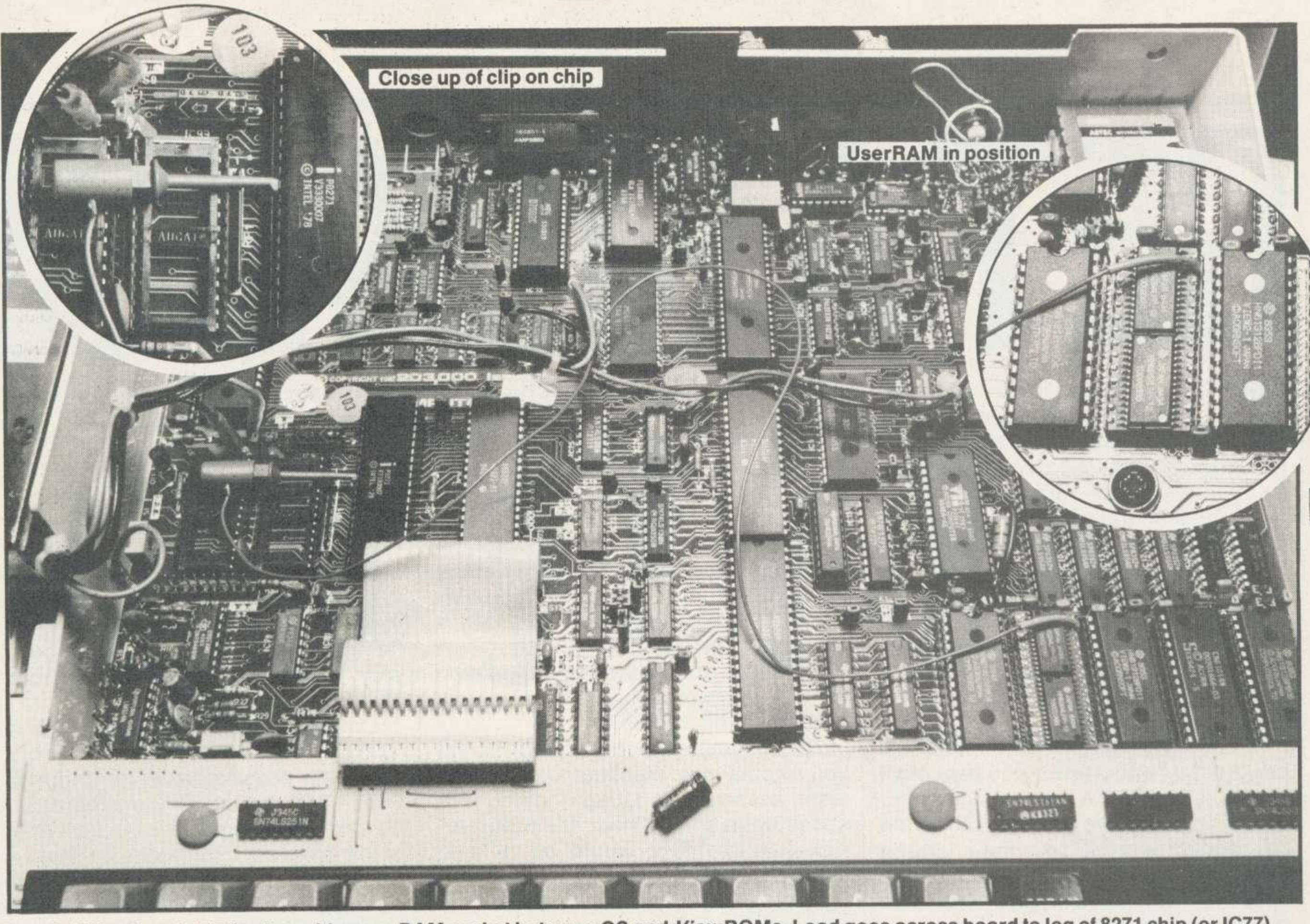
JULY's WINNERS

JULY's competition brought in a bumper harvest – over 1000 of you eager to win and almost entirely correct. The answers were:

4 * 6 * 8 * 93 * 7251 = 129473856
6 * 7 * 9 * 51 * 8423 = 162378594
6 * 9 * 8 * 71 * 4523 = 138729456
6 * 7 * 9 * 831 * 524 = 164597832
6 * 7 * 52 * 84 * 913 = 167495328
6 * 7 * 54 * 91 * 823 = 169857324
6 * 7 * 84 * 92 * 531 = 172349856
6 * 8 * 53 * 92 * 741 = 173429568
7 * 9 * 54 * 83 * 621 = 175349286

The lucky winner was N Woodnick of Kenton, Middlesex, who receives a Casio 6000 music keyboard, MIDI interface and composer software.

The 50 runners-up who get copies of *Repton* are J G Morgan, G Smetham, K Bowden, J W Boughton, J Ward, G Batty, Sally Yendell, Jurek Swiszczowski, C Hubbard, Geraint Lloyd Jones, John Newnham, S J Stokes, T Swanwick, S H Packer, D Kenny, S V Hay, D Bennett, Diana Willcocks, Claire Neesham, Robert Miller, David Greenwood, Graham Willcocks, C J Green, R Burhouse, J Pearson, John Sherwood, Stephen Tingey, Dominic Lee, Ben Silburn, P A Byrne, R Smeethe, R L Paton, J K Basi, T J Carey, W Dear, J Marshall, R Dehele, P Ormerod, Pete Upson, A R Thomas, J O Linton, Margaret Evans, J A Bryant, T van Rossum, N P C Barnard, Richard Stott, Alan Westrop, Peter Clements and J Bennett.



UserRAM in place in BBC micro sideways RAM socket between OS and *View* ROMs. Lead goes across board to leg of 8271 chip (or IC77)

EASIEST SIDEWAYS RAM TO FIT

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TAKE a piece of software, load it in UserRAM using the utilities provided and it can be accessed instantly using a '*' command or run as a Basic program: no waiting for the disc or cassette. It's just like using software on a chip such as *Wordwise* or *View*.

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GET A KICK OUT

THE main aim of a good interpreter is to take the language of his or her client and translate it into a foreign tongue as clearly as possible, so that others can understand it. Obviously most interpreters work in what is called 'real-time' or at the same time that the client wishes to converse. You might consider communicating by letter, in which case you need to type your letter and hire someone called a translator, who will retype your letter in the foreign language all in one go.

Interpreters versus translators

Look at figure 1a. Here is the best of all possible worlds – direct communication between two people. Either one or both understand the other's language, and communication is speedy and efficient. Figure 1b relates that to the computer. Again direct communication, but with the current state of the art, this has to be in the machine code of the particular computer (6502 for the BBC micro and Electron). The communication is efficient in terms of memory, and it is understood well by the recipient machine, but it takes a long time for the user to enter, and because of its complexity, you are liable to make many mistakes. Figure 1c shows the sequence of operation over an indeterminate period of time.

Figure 2a shows the situation where one person employs an interpreter. He talks in his natural language, the interpreter converts each sentence as it is spoken into the foreign tongue, and then the recipient can act on it. Figure 2b illustrates the same situation involving a micro with in-built interpreter.

The user enters a program which is converted line-by-line (as the program runs) to machine code. This conversion takes up quite a large part of the machine time, often taking longer to convert a line than to execute it. Figure 2c shows this time allocation. Remember, every time a BBC Basic program is being run, this interpreting process is slowing the computer.

Figure 3a shows the situation where a translator is employed, to convert a whole document into the foreign tongue. Because the originator is working in his language, his work is fast. The translator's work is mainly mechanical, and once the translating is done the foreign recipient can read and act on the information as quickly as he or she wishes.

Figure 3b takes the parallel one step further to the human-machine interface (HMI). Once run through a translating program, the user's code is reproduced as a program in machine language. Now it can be run as many times as required, but no further translation is needed, so there is usually a large gain in speed.

Figure 3c shows the time allocation for this approach. The translating program is called a compiler.

For maximum machine performance you should use machine code, or at least assembly language, which will speed up your machine code programming. However, it would be folly to expect everyone to write in machine language for every application. The alternative until recently has been to write in BBC Basic and run programs using the BBC Basic interpreter. This is generally acceptable, especially as most other micros follow the same approach. BBC Basic is one of the most efficient interpreted languages about, but there are times, for example in data manipulation, when speed is more important and consequently a compiler would be more efficient.

Unfortunately a typical compiler generates code which is much longer than the high level language program it replaces. In the BBC micro's case this means that compilers may be limited to second processors for any serious applications.

One of the easiest ways to demonstrate how interpreters and compilers work is to try inventing a very high level language of our very own, and then interpret it and also compile it to a lower level. The result is illuminating, and provides a useful precursor to serious language processing.

I'll apply the philosophy that it's important to get a small implementation of a finished product up and running, and then refine it to our new high level language processors. To begin, I'll specify that I wish to produce a very simple interpreter, capable of obeying a set of simple instructions which will let it play a tune.

A simple music interpreter

The easiest ASCII input of information is via the common note names, so I'll regard each note name as an instruction to sound a particular note. A program might be entered as:

```
EDCCDEFGGABcBAGGABc
  BAGABcGFEER
```

where each letter is a program command to play a particular note. CDEFGAB make up the lowest octave while cde etc are the upper octave. The letter R is a rest note which doesn't play. We will call this language Mule – MUsic LanguagE.

Listing 1 on the yellow pages is for version 1.00 of the music interpreter. The main program extends to line 80. First PROCgetdetails is called at line 60, and this procedure is the equivalent of the program input stage in Basic, or of a text editor in Pascal. It prompts for a program, receives it as a string, and calculates the length of the string, which is then placed in the variable 'programlength'.

Line 70 calls the actual interpreter which is made up of DEFPROCinterpretbody and DEFPROCinterpret. DEFPROCinterpretbody moves through each command in turn and passes it to DEFPROCinterpret. This procedure decodes what the instruction is, and then performs the equivalent Basic command – in other words, interpreting and executing.

Of course, every interpreter must be able to handle errors. Line 310 catches all unknown instructions and sends them to a primitive error-handling routine, DEFPROCerror. Showing absolutely no creativity at all we exit the program in this procedure after printing 'Music syntax error!'. Figure 4 shows the structural layout of this very simple interpreter. All interpreters will have similar components, though fortunately most commercial ones are much more sophisticated.

Version 1.00 can be upgraded to version 1.04 by making four small improvements. If you alter line 340 to read:

```
PRINT"I don't understand ";
command$
```

and add line 345

```
PRINTprogram$ 'TAB
(command–1);"^"
```

the error handling will be made more effective and user friendly.

You might also improve continuity

OF MULE

Building an interpreter and compiler for music, by tuneful Joe Telford

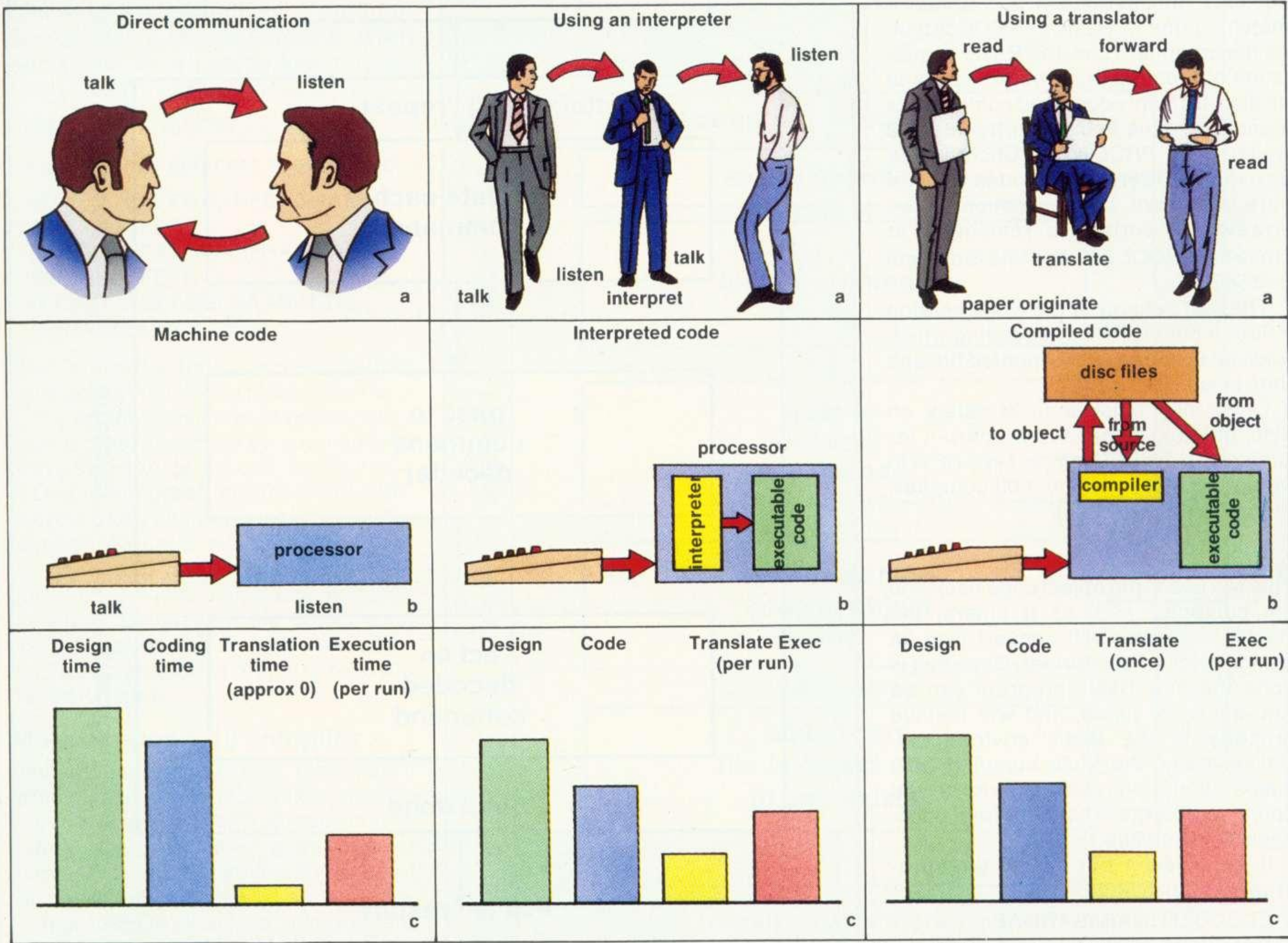


Figure 1. Direct communication

Figure 2. Using an interpreter

Figure 3. Using a translator

(because interpreters run continually) by altering both line 80 and line 350 to read RUN. This ensures that the interpreter is forever either waiting for program input or performing its interpretive task.

Building a compiler

Having tried to use the simple interpreter, you may already be finding that it has some problems in terms of its musical capabilities, but I'll return to these later. What you've learned in writing the interpreter can be used to design a matching compiler. Its task is simple – to take a program written in Mule and file to disc a program which will run in Basic.

Listing 2 is version 1.00 of the Mule compiler, and it has four major sections, which are called as procedures, and they are: PROCgetdetails, PROCstartcoding, PROCcompilebody and PROCendcoding.

There is much similarity between this compiler and the interpreter previously discussed. The 'getdetails' procedure sets up some initial system parameters – for example, the system always compiles to Basic with a first line number of 10 and line increments of 10. Also within this procedure, space is dimensioned for the OSCLI command, so that the compiler will function correctly with Issue 1 of Basic. Lines 130 and 140 are identical to the matching lines in the version 1.00 interpreter, and line 150 requests the name of the finished program. The compiled program will then be spooled to disc under this filename.

At line 190, PROCstartcoding opens a spool file on the disc with the first seven characters of the name supplied. If the name supplied is 'CHRISTMAS TUNE', for example, then its filename will be 'O.CHRISTM'. I use a directory labelled 'O' to indicate an Object or Target file, ie, a file which is receiving output code.

The 'startcoding' routine then writes a program heading to the disc, in lines 200, 210 and 220. Writing to disc is performed via PROCoutput, a procedure at lines 520 to 540. This simply prints whatever Basic program line is sent to it, with a line number prefixed to it, and then increments the line number by 10. For example, if we call:

```
PROCoutput("REM title line")
```

then the procedure would print:

```
10 REM title line
```

and then increment the line number to be 20. Because SPOOLing has been

ILLUSTRATION BY KEVIN JONES

invoked, the line appears on the screen and also on disc.

PROCcompilebody is identical to PROCinterpretbody in the version 1.00 Mule interpreter. It calls PROCcompile which is similar to PROCinterpret in the version 1.00 Mule interpreter, except that instead of decoding the instruction and playing the note, PROCcompile decodes the instruction and sends a matching line of Basic to PROCoutput. As the compiler runs, the Basic compilation of Mule appears on screen, and on disc. If an unrecognised command is found, then this is trapped by line 490 which calls PROCerror. Uncreatively as ever, PROCerror concludes with the bare minimum of information. It is, however, important to remember to close the SPOOL file, and this is done in line 580.

The last section of the Mule version 1.00 compiler is PROCendcoding which adds an END line to the spooled file and then closes it.

Once the object code is safely on disc, the next stage is to prepare it for running on the BBC micro. Type NEW to erase the Mule version 1.00 compiler, then type (for example):

```
*EXEC O.CHRISTM
```

This will EXEC the object code back into the computer and, as it enters, the Basic interpreter will convert it to its standard tokenised format. Once this is done the new Basic program can be run, saved or listed, and will behave properly in the Basic environment. Unlike many, the Mule compiler produces stand-alone code. (Yes folks, you don't need expensive run-time packages with the Mule.)

If we consider our earlier tune/program written in Mule:

```
EDCCDEFGGABcBAGGABc
BAGABcGFEER
```

the Basic equivalent looks like this:

```
10REM MUSIC PROGRAM CHRISTMAS
20REM AU. MUSIC COMPILER V1.00
30
40SOUND1,-15,68,8
50SOUND1,-15,60,8
60SOUND1,-15,52,8
70SOUND1,-15,52,8
80SOUND1,-15,60,8
90SOUND1,-15,68,8
100SOUND1,-15,72,8
110SOUND1,-15,80,8
120SOUND1,-15,80,8
130SOUND1,-15,88,8
140SOUND1,-15,96,8
150SOUND1,-15,100,8
160SOUND1,-15,96,8
170SOUND1,-15,88,8
180SOUND1,-15,80,8
190SOUND1,-15,80,8
200SOUND1,-15,88,8
210SOUND1,-15,96,8
220SOUND1,-15,100,8
230SOUND1,-15,96,8
240SOUND1,-15,88,8
250SOUND1,-15,80,8
260SOUND1,-15,88,8
270SOUND1,-15,96,8
280SOUND1,-15,100,8
290SOUND1,-15,80,8
300SOUND1,-15,72,8
310SOUND1,-15,68,8
320SOUND1,-15,68,8
330END
```

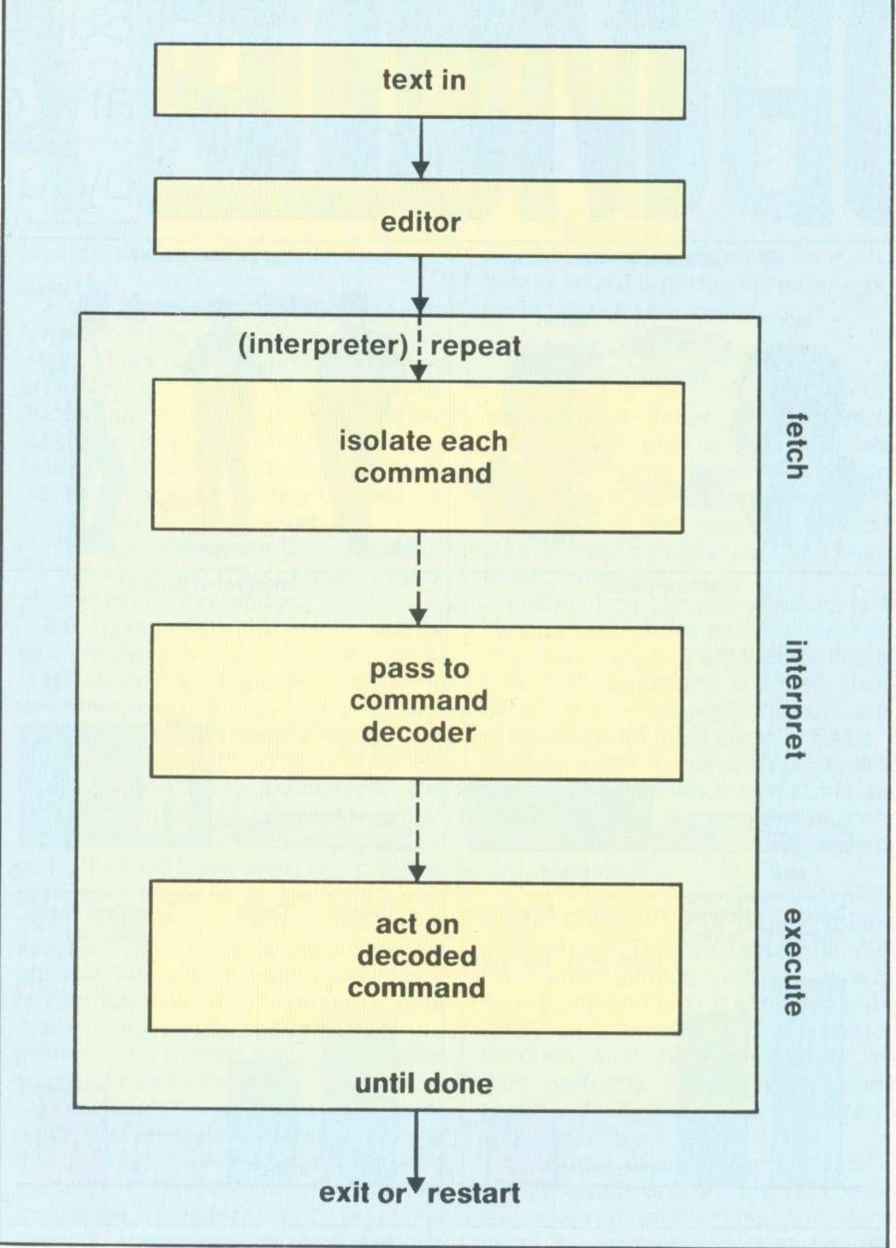


Figure 4. Structural layout of Mule interpreter version 1.00

Improving on the compiler

While it's possible to improve on the version 1.00 compiler in the same way that I upgraded the interpreter, I'll look further to providing the sort of features which will make the Mule compiler a more efficient workhorse.

An essential feature of a compiler is to be able to work with long programs written in a high level language. The method chosen in the Mule interpreter is to limit memory space to 255 ASCII characters. It would aid readability and program development if the Mule instructions could be presented in a multi-line format. Normally this would necessitate a program editor, adding a fair degree of complication to the interpreter or compiler. A better approach would be to write the program using a generally available text editing package such as *Wordwise*, *Wordwise Plus* or *View*. Readers with these packages might like to use them to create a suitable Mule program like this one, which is a much more readable version of

'CHRISTM'.

EDCCDEFGGABcBAGGABc
BAGABcGFEER
EDCCDEFGGABcBAGGABc
BAGABcGFEER
EDCCDEFGGcBAARAGGcBAGAB
cdedcc

If, however, you are one of the 20 per cent of disc users without a wordprocessor, then a minimal version which works with Mule can be found in the *BUILD command on your DFS. Type:

*BUILD S.CHRISTM

then as the line numbers appear, type:

0001EDCCDEFGGABcBAGGABc
BAGABcGFEER
0002EDCCDEFGGABcBAGGABc
BAGABcGFEER
0003EDCCDEFGGcBAARAGGc
BAGABcdedcc

Then press Escape. The result will be quite acceptable to the Mule compiler.

If a wordprocessor is in use to make source files, they must be spooled files with a directory prefix of S, for Source.

One of the great hassles of the BBC micro's EXEC system is that there are a number of manual tasks which need to be performed by the user before the object code will run as Basic. It would, therefore, be useful if the object code could be saved automatically as tokenised Basic and left in memory ready to be run or listed.

Mule version 1.10 compiler

Having understood the elementary principles of our version 1.00 compiler, you are now ready to improve on it to handle the two major points raised above. Figure 5 shows the structure of the upgraded compiler.

Upgrading to read from a source file requires changes in two areas of the compiler – in the 'getdetails' and the 'compilebody' procedures.

First amend the 'getdetails' procedure as follows:

```
110 DEFPROCgetdetails
120 linenumber=10:DIMoscli%
&100
125 INPUT"Source filename (or
RETURN) >> "source$
126 IFsource$<>""
PROCopensourcefile
130 IFsource$="" INPUT
"Program >> "program$
140 IFsource$="" programlength
=LENprogram$
150 INPUT"Object filename (or
RETURN) >> "name$
155 IF name$="" name$=source$
160 ENDPROC
```

This procedure now looks for a source file name and if entered attempts via PROCopensourcefile to open that file. If a source file exists then its object file can be given the same name by pressing Return when asked for an object filename. If you prefer not to use a source file, then pressing Return when asked for the source filename will prompt you for the direct entry of a Mule program (as in version 1.00).

Now we add PROCopensourcefile:

```
690DEFPROCopensourcefile
700cha%=OPENIN("S."+source$)
710IF cha%=0 PROCerror(1):
ENDPROC
720programlength=EXT#cha%
730ENDPROC
```

Notice that this entails a change to PROCerror, just in case it cannot find the source file on disc:

```
570 DEFPROCerror(x)
580 *SPOOL
590 P."Compilation error ";x
595 CLOSE#0
600 ENDPROC
```

Obviously if the program exists on disc in a source file, you'll need to read it from that disc. The simplest way is to alter line 270:

```
270 IF source$="" command$
=MID$(program$,command,1) ELSE
command$=CHR$BGET#cha%
```

which will read a direct entry program if no source file is around, otherwise the current command will be read from the source file on disc. Only a minimal change needs to be made to PROCcompile to allocate an error number to the PROCerror of line 490:

```
490PROCerror(2)
```

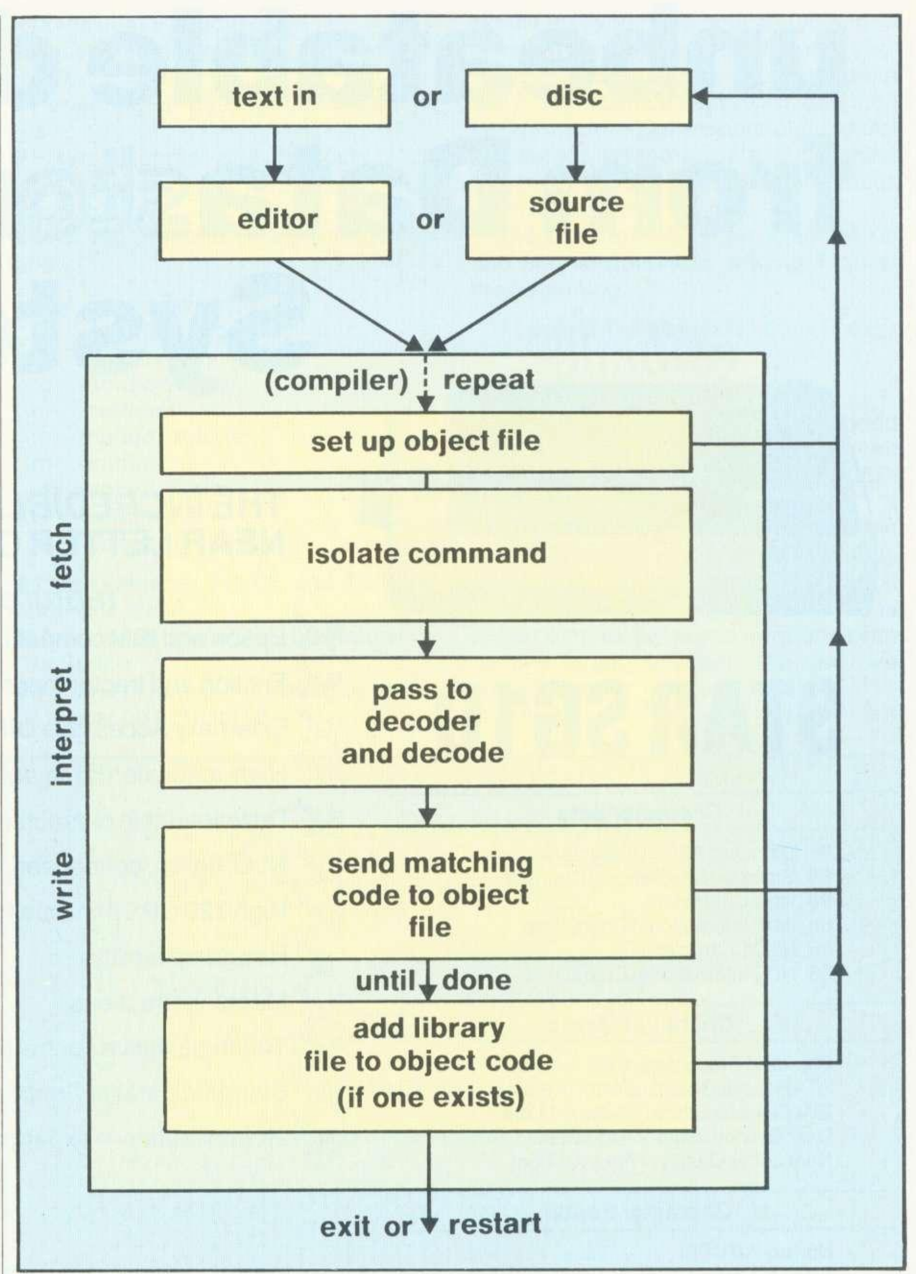


Figure 5. Mule compiler structure

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It is left to users to interpret further the error codes in DEFPROCerror, to make them user friendly.

In order to make the compiler behave continually until installation is requested, add lines 40 and 85:

```
40REPEAT
85UNTIL FNend
```

The FNend function is simply a point at which the compiler can check whether we wish to install the object code generated:

```
750DEFFNend
760INPUT"Install this code? (Y/N)
>> "answer$
770IF INSTR("Yy",LEFT$
(answer$,1)>0 THEN =TRUE ELSE
=FALSE
```

Now to initiate the installation:

```
86*FX3,2
```

This effectively switches off the screen.

```
90 PROCoscli("KEY 0 NEW¦M*E.
O."+LEFT$(name$,7)+"¦MSAVE
"+CHR$34+LEFT$(name$,7)
+CHR$34+"¦M*FX3,0¦MRUN¦M")
```

Imagine we have a spooled object file called 'O.TUNE'. Line 90 places the following command sequence into function key 0:

```
NEW
*E. O.TUNE
SAVE "TUNE"
*FX3,0
RUN
```

and these commands can be shipped into the keyboard buffer with line 100 as follows:

```
100*FX138,0,128
```

which means send to buffer 0 the contents of key 128. This must be followed immediately with an end of program marker, so add:

```
105 END
```

It's best to save the amendments to the compiler before running it, because on answering 'Y' to the question 'Install this code?' the compiler is erased, the object file EXECed into memory, and then saved back to disc in BBC Basic format, and finally run. You might like to alter line 90 to perform your own sequence of tasks.

Sound facilities

Listing 3 upgrades the Mule compiler to version 2.00, allowing a much more sophisticated syntax to Mule. It will, however, rely on externally entered source files (see the example of one above). The major features of this compiler include:

- Decoding any musical note between B.. (B below bottom B) to C''' (C three octaves above middle C)
- Decoding half-notes for example C# and Bb
- Repeating a passage enclosed in ()'s
- Playing legato and staccato type notes by using '–' for legato and '.' for staccato
- allocating time intervals to notes as follows:

s	semiquaver
.s	dotted semiquaver
q	quaver
.q	dotted quaver
c	crotchet
.c	dotted crotchet
m	minim
.m	dotted minim
S	semibreve
.S	dotted semibreve

- Three tempos, T1, T2, and T3 (fast, moderate, slow)
- Commands separated by Return or ':' or Space
- Volume of sound controlled by musical terms: pp p mp mf f ff

Notice that you need both a quaver and a dotted crotchet beat in the new section. Also note the use of '.' so that the two F notes can be separated, and then the return to '–' for smooth playing. All commands other than note names must be issued before the note which uses them is sounded.

The passage could be speeded up and played quietly by adding T1:p: at the beginning:

```
T1:p:(:c:E:D:C:R:):(:c:G:.:F:q:-:F:.c:E:)
```

Compiler version 2.00

You should have enough background now to see how the compiler has been upgraded. Look particularly at DEFPROCendcoding which contains a short 'library' of procedures that the object program can call on. Also pay attention to PROCcompilebody, which selects each command in turn. This is more complex because commands can be any length between one and five characters.

Other useful procedures are FNrntes, which decodes musical note commands, PROCcompileloop and PROCcompilenextloop which produces object code for repeated passages. PROCcompile handles the majority of commands and also initiates their object code.

```
T3:(:p:q:C´:A:G:F:G:.:A:-:C´:A:G:F:s:G:A:G:.:A
q:-:C´:A:mp:C´:D´:mf:A:D´:C´:mp:A:G:p:c:F:q:R
C´:A:G:F:G:.:A:-:C´:A:G:F:s:G:A:G:.:A
q:-:C´:A:mp:C´:D´:mf:A:D´:E´:C#´:mp:B:c:A:p:q:R
E´:C#´:B:A:B:C#´:E´:C#´:B:A:s:B:C#´:B:C#´
q:E´:mp:C#´:mf:E´:F´:C#´:F´:mp:E´:C#´:B:c:p:A:q:R
E´:C#´:B:A:B:C#´:E´:C#´:B:A:s:B:C#´:B:C#´
q:E´:mp:C#´:mf:E´:F´:D´:F´:G´:E´:D´:c:C´:q:R:f
G´:E´:D´:C´:s:D´:E´:D´:E´:q:G:E:D:C:s:D:E:D:E
ff:q:(:G´:E´:C´:G:E:C:)
f:C´:A:G:F:G:.:A:-:C´:A:G:F:s:G:A:G:.:A
q:-:C´:A:C´:D´:A:.:D´:-:D´:Bb:A:c:G:q:R
D´:Bb:A:G:A:Bb:D´:Bb:A:G:s:A:Bb:A:Bb
q:D´:Bb:D´:ff:E´:Bb:.:E´:f:-:E´:C´:E´:F´:C´:.:F´:-
F´:D´:F´:G´:D´:G´:ff:m:-:A´:q:A´:R:)
p:C´:A:G:F:G:.:A:-:C´:A:G:F:mp:s:G:A:G:.:A:pp:.m:C´
```

Morning mood: an example of an externally entered source file

- Rested notes not sounded

Let's see how we would write *Three Blind Mice* in Mule: the first phrase is 'Three blind mice' and that requires crotchet timing, for four beats, and so you would write:

```
c:E:D:C:R
```

This means play crotchets, and sound the notes E:D:C and then rest for one beat.

The next phrase is a repeat of the first phrase, and so we can cater for this by adding brackets:

```
(:c:E:D:C:R:)
```

The next phrase, 'See how they run', is also repeated, producing:

```
(:c:E:D:C:R:):(:c:G:.:F:q:–:F:.c:E:)
```

Conclusion

If there is sufficient interest I will follow up this article with a multi-voiced compiler for more serious music work. Until then, happy compiling!

Next month I'll be looking at plotters and graphics.

Joe's interpreter and compiler listings are on yellow pages 118-120

BACK·ISSUES

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24. July Communications: the future; portable micros; modems & electronic mail. Hints & Tips. First Byte: using your micro. Beeb Forum on Basic. How it works II: slow down the Beeb. Business: Acorn's Z80 software, Starbase ROM. Education: a look at Edfax, how to teach facts. Atom Forum. Converting BBC to Atom Basic. Reviews: Electron Plus-1, Solidisk's 128k RAM board, three IEEE interfaces, Canon colour and Brother printers, ADE ROM.

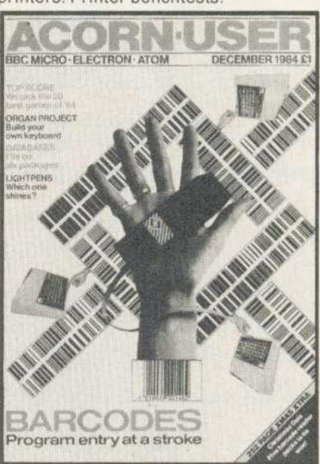


25. August Downloading the weather. Teaching tots: keyboard overlays, activity board. First Byte: writing & debugging programs. Hints & Tips. Beeb Forum: 6502 second processor & Tube tips. How it works III: random numbers. Business: Plan software for Z80. Atom Forum, avoiding errors. Reviews: 3 drawing packs, Torch Unicomm, MCP's Interbeeb, software plus for Micronet.

26. September Decoding radio signals, First Byte: getting moving. Hints & Tips. Education: problem solving. Sprite design and animation part I. Beeb Forum: fastest dump. Write your own disc formatter. How it works IV: random number generator. Business: Nucleus software for Z80, accounts. Atom Forum, ? and !. Reviews: Torch Unicorn, Quinkey, Parfitt plotter, Turbo compiler, Multi-aid.

27. October The BBC and space. First Byte: noises on the Elk. Hints & Tips. Sprite design and animation part II. Programming the 8271. Sorting techniques. Diagnosing ills in the Beeb. Beeb Forum: NFS update. Education: report on government scheme, review of Microtext. Atom: wordprocessor. Communications: bulletin boards. Reviews: Basic utility ROMs, sideways ROM sockets, Bearsoft's Editor, Watford's Buffer & Backup, Ampersand's Colour module.

28. November Acorn's ABC range. First



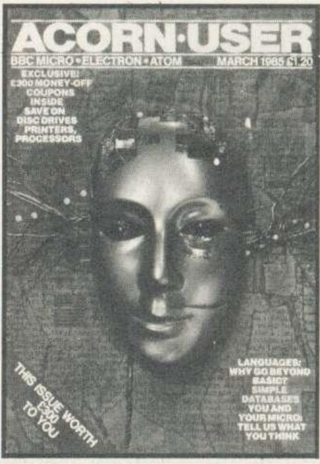
Byte: drawing. Hints & Tips: 3D-effect printing. Sprite design and animation part III. Floating point variables. ROM juggler. *Micro Live*. Education: news, Edword in the classroom, school quiz. Atom forum: hardware, the Auto command. Reviews: Six turtles and buggies. Toad's extension socket, Watford's Speech Synthesiser and Beebfont ROM, BBtype, Romex 13 ROM board, 3 language coaching packs, two graphics tablets.

29. December Guide to bar codes. First Byte: text & graphics windows. Hints & Tips: control codes for Epsons. The Domesday project. Low-cost keyboard for the Beeb. Dumping games' screens. Speed up your micro. DIY database. Education: news, science quiz, review of the Dudley suite of software. Atom: Forum, build a ROM pager, competition. Reviews: 6 databases compared, part I of lightpens, Acornsoft's Logo and Pascal, best games of 1984.

30. January 1985 Games special: Quadline, Picture Puzzle, musical tunes. Colourfill graphics. Hints & Tips. Operation Raleigh report. Setting up your own teletext database. Second processors examined. Education: news, activity board revisited. Reviews: 6 wordprocessors compared, three astronomy packs, software for lightpens.

31. February Painting and drawing program(4). 1983/84 Index Part 1(4). Hints & Tips: writing a database(4). First Byte: Electron add-ons(3). Interfacing with the analogue port(3). Random access files(6). Atom Forum: Basicode conversion(3). Business: making the most of the Z80(2). Education: Turtle graphics(7), news. Colourfill graphics part 2. Reviews: spreadsheets, modems, Seikosha and Smith Corona printers. Printer benchtests.





32. March Languages – why learn another? 1983/84 Index Part 2. Hints & Tips. First Byte: inputting information. Quick-draw circles. Mode 7 graphics. Programmable second keyboard. Business: news, Sage review. Atom Forum. Education: news, software. Reviews: Micro Robotics EV1 camera, Smith Corona Fastex 80 printer, 6809 second processors, machine code monitors.

33. April Business special CP/M explained, Zep 100 reviewed, news. Hints & Tips: April Fool trick. First Byte: handling strings. Logo. Colours by interrupts. Plotting equasions. DIY icons. Measure electrical resistance with the ADC. Atom Forum. Education news, software. Reviews: Demon modem, AMX mouse, RAM/ROM boards, modem software.

34. May Education special Guide to 800 software titles, Logo – four implementations reviewed, GSL hard disc system, alternative keyboards, news, software reviews. Cartoon creator. Capital checking routine. Multiple modes on screen. Extra commands for Basic. Sound compiler. Measuring voltages with the ADC. Hints & Tips: Basic 1 and 2 differences. First Byte: loops. Atom Forum. Business: improving MemoPlan, CP/M tips, Quickcalc, ledger and stock control software reviewed. Reviews: Sweet Talker speech synthesiser.

35. June Robotics special Robot round-up, Movits, Fischertechnik kit, BBC Buggy, Beasty, Zero 2 reviewed. Comal. Scrolling display board. Sideways RAM utilities part 1. View printer driver generator. Hints & Tips. First Byte: entering listings. Atom Forum. Business: changing CP/M, CP/M corner. Reviews: Concept Keyboard software, Castle Quest, Music 500.

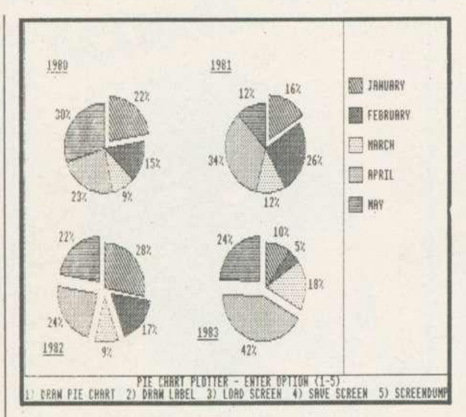
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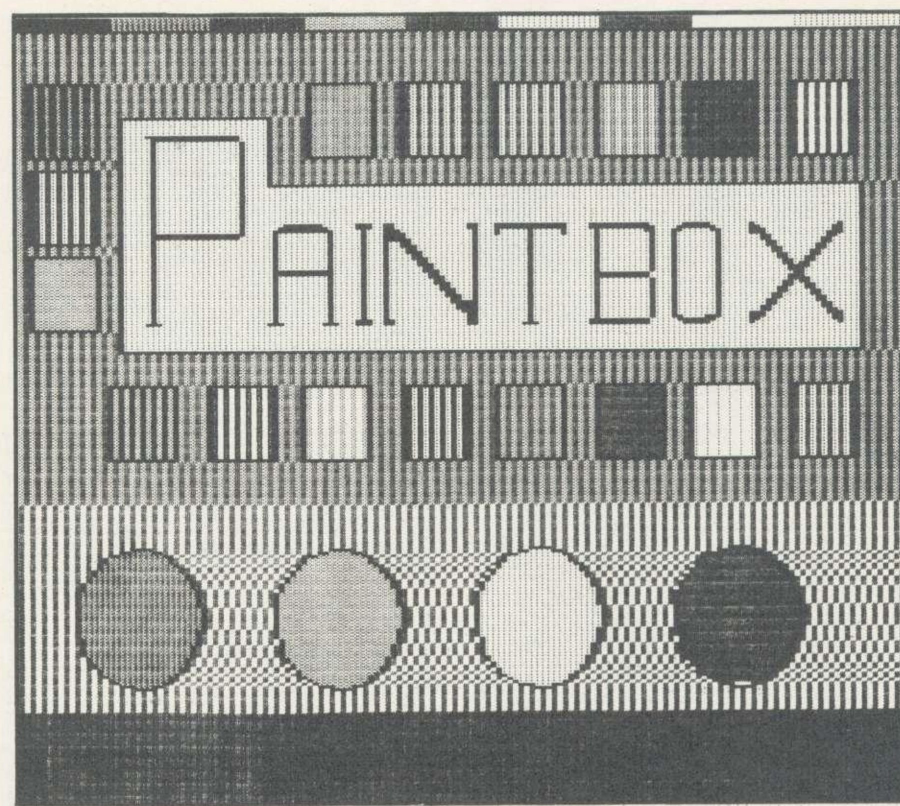
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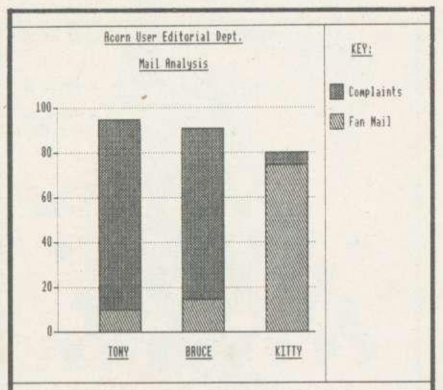
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Above: Paintbox palette; top left: pie chart from Dotfill; bottom left: Peter Sandford's bar charts; below left: Sprite designer

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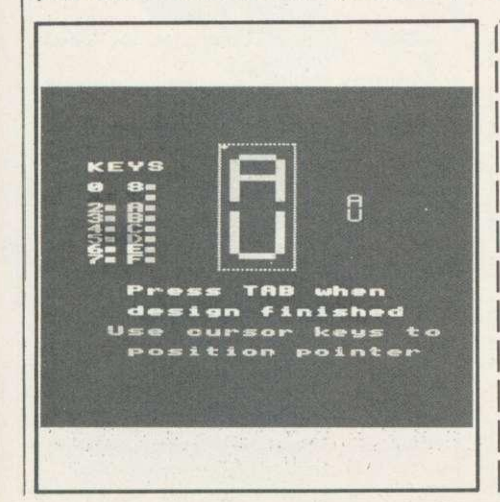
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Paintbox, from the February 1985 issue, offers you a wide palette of facilities – airbrushing, drawing circles and squares, colour filling, colour mixing and textured effects – and it's fast!

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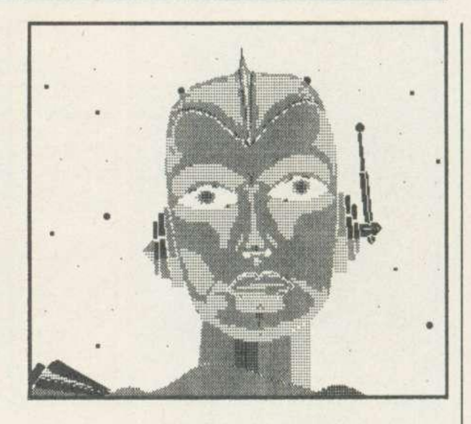
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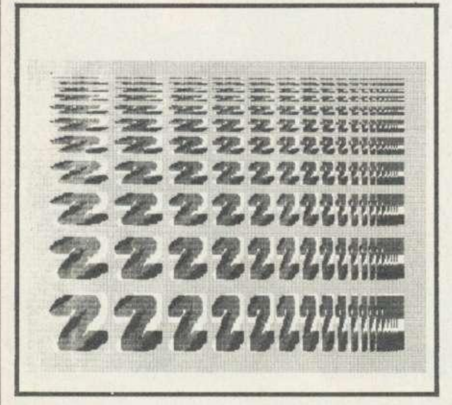
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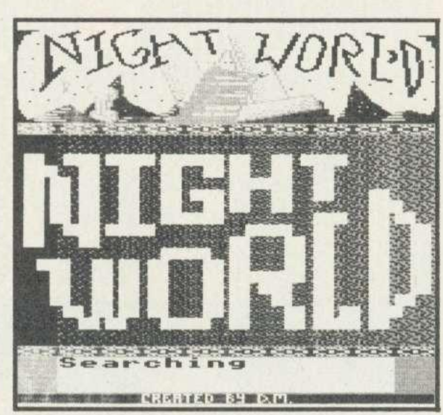
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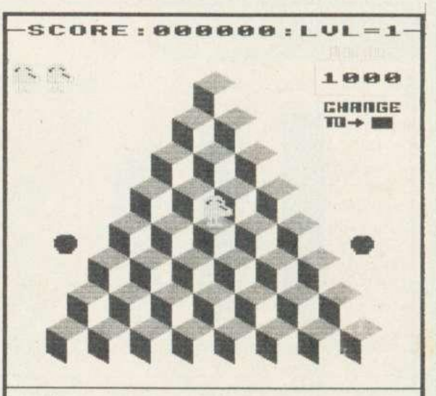












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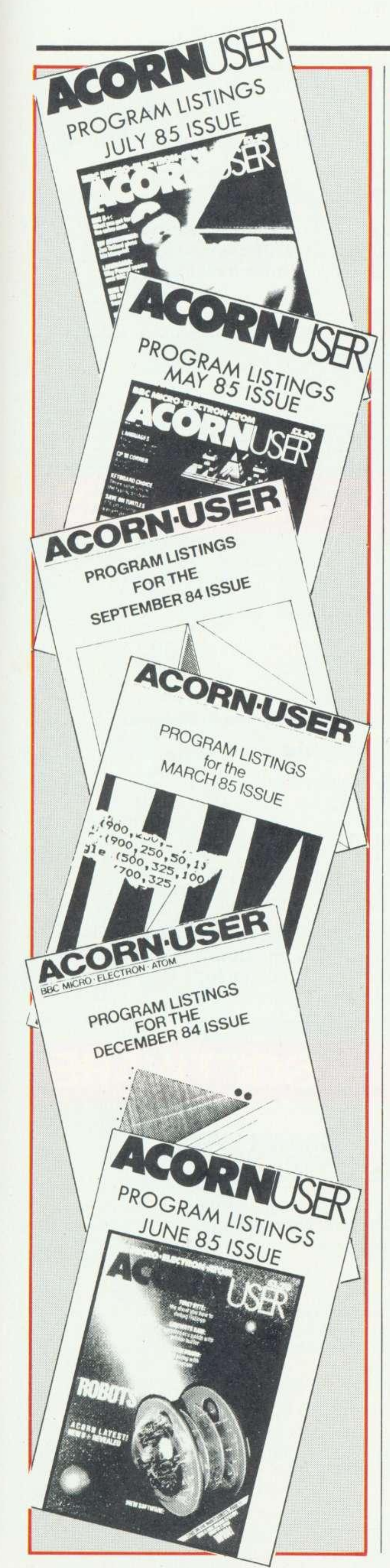
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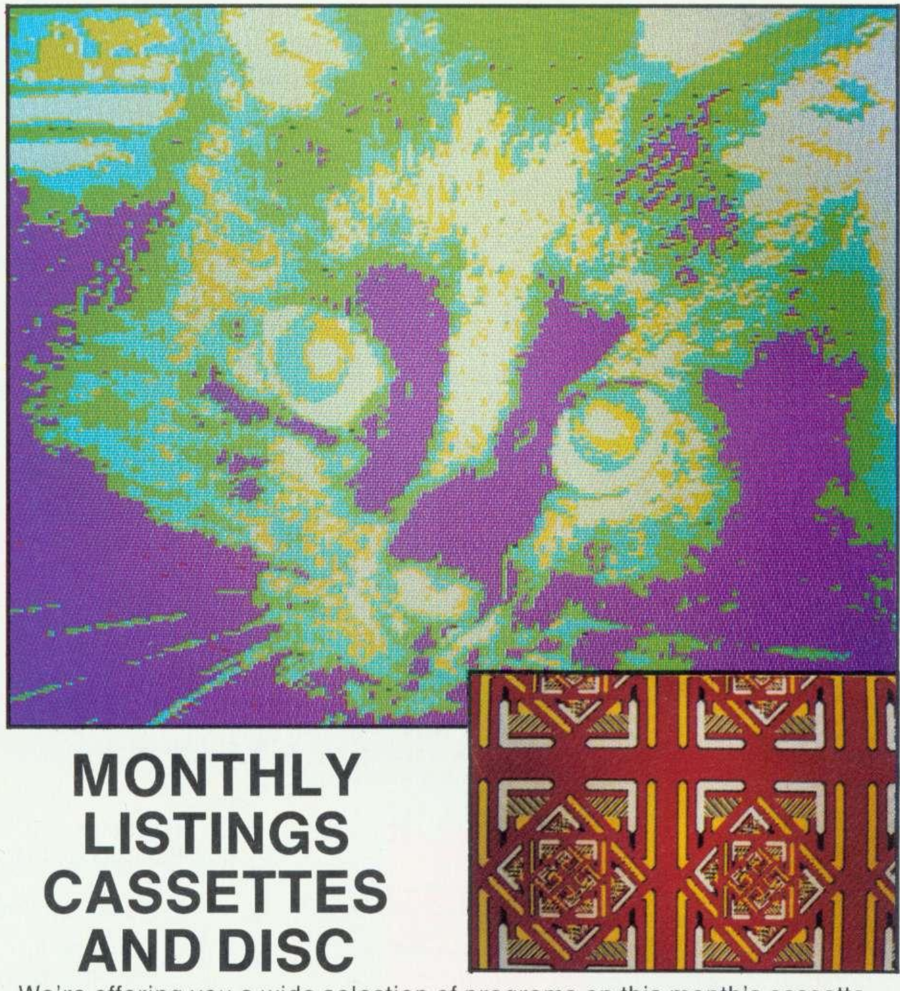
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***RTT**	restores a teletext screen after *TRANSTT
***LPRINT**	directs all PRINT commands to the printer only
***LPOFF**	cancels *LPRINT
***C@**	sets up CTRL @ option
***SET**	sets the printer text style
***RESET**	turns off the effect of *SET
***MAR**	sets either printer margin
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***CP80**	selects a CP80 type printer
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For the second month running we're making a disc version available which will also feature screens from Malcolm Banthorpe's digitiser review, competitively priced at £5.75. Incidentally, if you missed the special October disc featuring graphics, you can order it using the coupon below.

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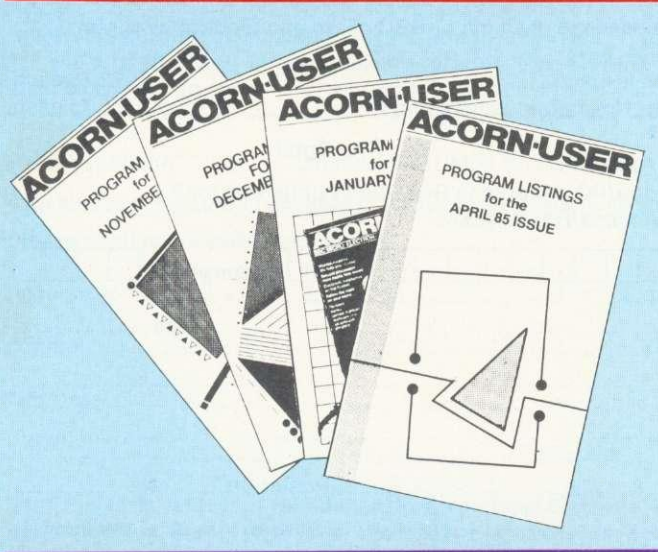
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See Hints & Tips, page 49

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PROGRAM		Page	BBC B	BBC B+	6502SP	Electron	Monthly cassette
Hints & Tips:	Listing 3	105	●	●	●	●	●
	Listing 4	105	●	●	●	●	●
Maths in Motion:	Listing 1	106	●	●		●	●
Tesselator:	Listing 1	108	●	●	●	●	●
	Listing 2	109	●	●	●	●	●
	Listing 3	109	●	●	●	●	●
	Listing 4	110	●	●	●	●	●
Freehand – part 2:	Listings 1-15	111-117	●	●	●	●	●
Joe's Jottings:	Listing 1	117	●	●	●	●	●
	Listing 2	118	●	●	●	●	●
	Listing 3	118	●	●	●	●	●
Compiler Benchmarks:	Listings 1-4	120	●	●	●	●	● *a*

a Although all of the benchmark listings will work on all the systems mentioned, not all of the compilers reviewed were compatible with those systems. For example. *Accelerator* was the only one that worked across the Tube.

Entering listings

Where possible, programs are listed with line numbers in increments of 10. With these listings, simply type AUTO <RETURN> before you begin. This will give automatic line numbering. Don't type a space after the line number. To list your program so it appears identical to the printed version in the magazine, type: LISTO 1 <RETURN> WIDTH 40 <RETURN> LIST <RETURN>

With screen modes 1,4,6 or 7, WIDTH 40 is not needed. Note that occasionally, for clarity, programs are listed with a text width different to our standard of 40 characters.

Most typing mistakes in Basic will cause error messages when the program is run. Finding errors in assembly language listings is often harder, so we provide checksums where we can. These are small routines which report any mistakes in assembled machine-code. In the August issue of *Acorn User* we published a program for calculating checksums for Basic programs. See page 109 for details of our monthly Basic checksum sheets.

Listing 3. Martin Phillips' routine to print double height text

```
   10 REM Listing 3
   20 REM by Martin Phillips
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User November 1985
   50 :
   60 MODE 1
   70 PROCdouble("Double Height",4,10)
   80 END
   90 :
  100 DEF PROCdouble(A$,x,y)
  110 REM Double height text
  120 X%=0:Y%=9:A%=10:D=&900
  130 C$=CHR$(240)+CHR$8+CHR$10+CHR$(241)
  140 FOR N=1 TO LEN(A$)
  150 B$=MID$(A$,N,1):?D=ASC(B$):CALL&FFF1
  160 VDU 23,240,D?1,D?1,D?2,D?2,D?3,D?3,D
?4,D?4
  170 VDU 23,241,D?5,D?5,D?6,D?6,D?7,D?7,D
?8,D?8
  180 PRINT TAB(x+N-1,y)C$
  190 NEXT N
  200 ENDPROC
```

Listing 4. Produces double height and double width

```
   10 REM Listing 4
   20 REM by Phil Hardcastle
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User November 1985
   50 :
   60 MODE 0
   70 DIM wide 100
   80 PROCdouble("Wide",4,10)
   90 PROCdouble("Letters",1,16)
  100 END
  110 :
  120 DEF PROCdouble(A$,x,y)
  130 REM Double width and double height
 text
  140 osword=&FFF1
  150 in%=0
  160 X%=0:Y%=10:A%=10:DO=&A00:D=&900
  170 C$=CHR$(240)+CHR$(241)+CHR$8+CHR$8
  180 C$=C$+CHR$10+CHR$(242)+CHR$(243)
  190 PROCassemble
  200 FOR N=1 TO LEN(A$)
  210 B$=MID$(A$,N,1)
  220 ?DO=ASC(B$)
  230 CALL osword
  240 CALL wide
  250 VDU 23,240,D?1,D?1,D?3,D?3,D?5,D?5
,D?7,D?7
```

Continued ▶

◀ Listing 4 continued

```
  260 VDU 23,241,D?2,D?2,D?4,D?4,D?6,D?6
,D?8,D?8
  270 VDU 23,242,D?9,D?9,D?11,D?11,D?13,
D?13,D?15,D?15
  280 VDU 23,243,D?10,D?10,D?12,D?12,D?1
4,D?14,D?16,D?16
  290 in%=in%+2
  300 PRINT TAB(x+in%,y)C$
  310 NEXT N
  320 ENDPROC
  330 :
  340 DEF PROCassemble
  350 store=&900
  360 chrdef=&A00
  370 tmpstore=&70
  380 bitcount=&71
  390 twobytecount=&72
  400 FOR pass%=0 TO 2 STEP2
  410 P%=wide
  420 [OPT pass%
  430 LDX #1
  440 LDY #1
  450 .locloop
  460 LDA #0
  470 STA twobytecount
  480 LDA chrdef,Y
  490 STA tmpstore
  500 .bloop
  510 INC twobytecount
  520 LDA #0
  530 STA bitcount
  540 .lloop
  550 LDA tmpstore
  560 ROL A
  570 LDA store,X
  580 ROL A
  590 STA store,X
  600 LDA tmpstore
  610 ROL A
  620 STA tmpstore
  630 LDA store,X
  640 ROL A
  650 STA store,X
  660 INC bitcount
  670 LDA bitcount
  680 CMP #4
  690 BNE lloop
  700 INX
  710 LDA twobytecount
  720 CMP #2
  730 BNE bloop
  740 INY
  750 CPY #9
  760 BNE locloop
  770 RTS
  780 ]
  790 NEXT pass%
  800 ENDPROC
```

Continued ▶

See 'Maths in motion', page 60

Listing 4a. Alteration of the double width procedure from listing 4

```
  120 DEF PROCdouble(A$,x,y)
  130 REM Double width text
  140 osword=&FFF1
  150 in%=0
  160 X%=0:Y%=10:A%=10:DD=&A00:D=&900
  170 C$=CHR$(240)+CHR$(241)
  180 :
  190 PROCassemble
  200 FOR N=1 TO LEN(A$)
  210 B$=MID$(A$,N,1)
  220 ?DD=ASC(B$)
  230 CALL osword
  240 CALL wide
  250 VDU 23,240,D?1,D?3,D?5,D?7,D?9,D?1
1,D?13,D?15
  260 VDU 23,241,D?2,D?4,D?6,D?8,D?10,D?
12,D?14,D?16
  270 :
  280 :
  290 in%=in%+2
  300 PRINT TAB(x+in%,y)C$
  310 NEXT N
  320 ENDPROC
```

Entering Maths in motion

ERRORS made while typing in the Basic part of the listing can be corrected in the usual way, responding to error messages as they occur. To ensure that no mistakes are made entering the assembly language, a checksum is provided. If this reports an error, go back and check your listing carefully. Common mistakes include typing ';' instead of ':' and reversing letters, eg, typing 'TYA' instead of 'TAY'. If no errors are reported, delete the checksum and save the program.

Using the Electron or B+

BECAUSE the program directly addresses the screen it will not work on a BBC B+ that is using shadow RAM for the display – you must make sure that shadow RAM is off before running the program. *Maths in Motion* will run on the Electron with no alterations needed.

Listing 1. Michael St Aubyn's program for producing Lissajous figures

```
   10 REM Maths In Motion
   20 REM by Michael St Aubyn
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User October 1985
   50 :
   60 MODE4:VDU23;8202;0;0;0;
   70 code=&5100
   80 xwave=&5200:ywave=&5300
   90 lostore=&5400:histore=&5500
  100 bytestore=&5600
  110 *KEY0 RUN|M
  120 *KEY10 OLD|MLIST,560|M
  130 VDU23,1,0;0;0;0;
  140 PROCzeropage
  150 PROCassemble
  160 PROCinitialise
  170 PROCstore
  180 *FX 4,1
  190 *FX 15,1
  200 ON ERROR
```

Continued ▶

◀ *Listing 1 continued*

```
  210 :
  220 REPEAT
  230 *FX 12
  240 FOR A%=0 TO &FF STEP 4
  250 A%!histore=-1:NEXT A%
  260 CLS:CALL code
  270 PRINTTAB(00,31)"X frequency=";
  280 PRINT;?xinc+256*(?xinc>127);
  290 PRINTTAB(23,31)"Y frequency=";
  300 PRINT;?yinc+256*(?yinc>127);
  310 *FX 11
  320 REPEAT UNTIL NOT INKEY-99
  330 *FX 15,1
  340 anykey=GET
  350 UNTIL FALSE
  360 END
  370 :
  380 DEF PROCinitialise
  390 max=2*PI
  400 PRINTTAB(3,10)"Initialising tables
 - please wait"TAB(12,12)"Counting..."
  410 FOR A%=0 TO 255
  420 PRINTTAB(23,12);255-A%;"  "
  430 a=max*A%/255
  440 x=(SINa)^3
  450 A%?xwave=x*127+128
  460 y=x
  470 A%?ywave=y*127+128
  480 NEXT A%
  490 xfreq=2:yfreq=-2
  500 xspeed=1:yspeed=1
  510 phasediff=0
  520 ENDPROC
  530  :
  540 DEF PROCstore
  550 bytedata!0=&10204080
  560 bytedata!4=&01020408
  570 ?xstart=0:?ystart=phasediff
  580 ?xstartinc=xspeed
  590 ?ystartinc=yspeed
  600 ?xinc=xfreq:?yinc=yfreq
  610 ?firstxinc=xfreq
  620 ?firstyinc=yfreq
  630 ?storeindex=0
  640 ENDPROC
  650 :
  660 DEF PROCassemble
  670 FOR pass=0 TO 2 STEP 2
  680 P%=code
  690 [OPT pass
  700 \ change X & Y start positions
  710 LDA xstart
  720 CLC
  730 ADC xstartinc
  740 STA xstart
  750 STA xindex
  760 LDA ystart
  770 CLC
  780 ADC ystartinc
  790 STA ystart
  800 STA yindex
  810 .loop
  820 \ rub out old pixel
  830 LDX storeindex
  840 LDY #0
  850 LDA lostore,X
  860 STA addr
  870 LDA histore,X
  880 STA addr+1
  890 LDA bytestore,X
  900 EOR (addr),Y
  910 STA (addr),Y
  920 \ find address of new pixel
  930 LDA #32*4
  940 STA addr
  950 LDY yindex
  960 LDA ywave,Y
  970 TAY
  980 LSR A
```

Continued ▶

◀ Maths in motion listing 1 continued

```
 990 LSR A
1000 LSR A
1010 STA addr+1
1020 LSR A
1030 ROR addr
1040 LSR A
1050 ROR addr
1060 ADC addr+1
1070 TAX
1080 TYA
1090 AND #7
1100 ADC addr
1110 STA addr
1120 BCC addx
1130 INX
1140 CLC
1150 .addx
1160 LDY xindex
1170 LDA xwave,Y
1180 LDY storeindex
1190 AND #&F8
1200 ADC addr
1210 STA addr
1220 STA lostore,Y
1230 TXA
1240 ADC #&58
1250 STA addr+1
1260 STA histore,Y
1270 \ draw new pixel
1280 LDX xindex
1290 LDA xwave,X
1300 AND #7
1310 TAX
1320 LDA bytedata,X
1330 STA bytestore,Y
1340 LDY #0
1350 ORA (addr),Y
1360 CMP (addr),Y
1370 BNE pixeldraw
1380 LDY storeindex
1390 LDA #&FF
1400 STA histore,Y
1410 BNE drawn
1420 .pixeldraw
1430 STA (addr),Y
1440 .drawn
1450 \ change X & Y indices
1460 LDA xindex
1470 CLC
1480 ADC xinc
1490 STA xindex
1500 LDA yindex
1510 CLC
1520 ADC yinc
1530 STA yindex
1540 DEC storeindex
1550 BEQ keys
1560 JMP loop
1570 \ check keyboard input
1580 .keys
1590 LDX #0
1600 LDY #0
1610 LDA #129
1620 JSR &FFF4
1630 CPY #&1B
1640 BNE space
1650 LDA #126
1660 JSR &FFF4
1670 .space
1680 CPX #32
1690 BNE left
1700 RTS
1710 .left
1720 CPX #136
1730 BNE right
1740 DEC xinc
1750 .right
1760 CPX #137
```

Continued ▶

◀ Continued

```
1770 BNE down
1780 INC xinc
1790 .down
1800 CPX #138
1810 BNE up
1820 DEC yinc
1830 .up
1840 CPX #139
1850 BNE return
1860 INC yinc
1870 .return
1880 CPX #13
1890 BNE codejump
1900 LDA firstxinc
1910 STA xinc
1920 LDA firstyinc
1930 STA yinc
1940 .codejump
1950 JMP code
1960 ]
1970 NEXT pass
1980 :
1990 REM Checksum
2000 total%=0
2010 FOR byte%=code TO (P%-1)
2020 total%=total%+?byte%:NEXT byte%
2030 IF total%<>24907 PRINT"Checksum er
ror - please check listing":END
2040 :
2050 ENDPROC
2060 :
2070 DEF PROCzeropage
2080 xstart=&70:ystart=&71
2090 xstartinc=&72:ystartinc=&73
2100 xindex=&74:yindex=&75
2110 xinc=&76:yinc=&77
2120 firstxinc=&78:firstyinc=&79
2130 addr=&7A:storeindex=&7C
2140 bytedata=&7D
2150 ENDPROC
```

See 'Shape up with tesselations', page 82

Entering McGregor and Watt's programs

FOUR listings are presented, all of which are in Basic only. Listing 1 is the main tesselation program. The other listings are all enhancements of the main program so should either be typed in as if they are extra lines from the main program or saved as separate programs and then added to the main program using the *SPOOL technique for merging Basic listings – the technique is described in the User Guide. For a full description of the listings see the article on page 82. All the listings are suitable for BBC B, BBC B+, Electron and BBC with a 6502 second processor.

Listing 1. The main tesselation program

```
   10 REM Program 1 - Simple Tile
   20 REM Deformations
   30 REM by Jim McGregor & Alan Watt
   40 REM for BBC B/B+ and Electron
   50 REM (c) Acorn User November 1985
   60 :
   70 vmax=150
   80 DIM x(vmax),y(vmax),prevl vmax,nex
tl vmax,corrv vmax
   90 DIM prevv vmax,nextv vmax,corrl vm
ax
  100 MODE 4:xstep=4:ystep=4
  110 PROCinitialise
  120 command$=GET$
  130 REPEAT
  140 PROCcommand
  150 UNTIL command$="Q"
  160 *FX 4,0
  170 *FX 12,0
  180 PROCcountcomms
  190 MODE 7:END
  200 DEF PROCinitialise
  210 LOCAL v
  220 vp=-1:lp=-1
  230 start=vp+1
  240 READ lastvertex,xstart,ystart
  250 FOR v=0 TO lastvertex
  260 vp=vp+1:lp=lp+1
  270 READ x(vp),y(vp),prevl?vp,nextl?vp
,corrv?vp
  280 READ prevv?lp,nextv?lp,corrl?lp
  290 NEXT v
  300 READ ygridinc,xshift,xgridinc,yshi
ft
  310 PROCstartplanning
  320 *FX 4,1
  330 VDU 23,1,0;0;0;0;
  340 left$=CHR$(136):right$=CHR$(137)
  350 up$=CHR$(139):down$=CHR$(138)
  360 dcomms$=left$+right$+up$+down$+"F"
  370 *FX 11,10
  380 *FX 12,1
  390 ENDPROC
  400 DEF PROCstartplanning
  410 atvertex=TRUE:vertex=start
  420 comms$="QTPCAD"
  430 GCOL 0,1
  440 PROCdrawplanningshape
  450 GCOL 3,1
  460 px=x(vertex):py=y(vertex)
  470 cpx=x(nextv?(corrl?(nextl?vertex)))
```

Continued ▶

◀ Continued

```
  480 cpy=y(nextv?(corrl?(nextl?vertex))
  490 PROCcursors
  500 ENDPROC
  510 DEF PROCdrawplanningshape
  520 CLG
  530 VDU 29,xstart;ystart;
  540 PROCdrawshape(0,0,1)
  550 ENDPROC
  560 DEF PROCdrawshape(sx,sy,scale)
  570 LOCAL v,vcount
  580 v=start
  590 MOVE sx,sy
  600 FOR vcount=0 TO lastvertex
  610 v=nextv?(nextl?v)
  620 DRAW sx+x(v)*scale,sy+y(v)*scale
  630 NEXT vcount
  640 ENDPROC
  650 DEF PROCcommand
  660 PROCcountcomms
  670 IF INSTR(comms$,command$)=0 THEN V
DU7:command$=GET$:ENDPROC
  680 IF command$="T" THEN PROCtesselate
  690 IF command$="P" THEN PROCstartplan
ning
  700 IF command$="C" THEN PROCclock(com
s)
  710 IF command$="A" THEN PROCanticlock
(coms)
  720 IF command$="D" THEN PROCdeform
  730 IF nextcom$="" THEN command$=GET$
ELSE command$=nextcom$
  740 ENDPROC
  750 DEF PROCtesselate
  760 LOCAL leftx,sx,sy,s,stopx,stopy
  770 *FX 12,0
  780 CLS:INPUT "Scale factor",scale
  790 *FX 11,10
  800 *FX 12,1
  810 CLG:VDU 29,0;0;
  820 planning=FALSE
  830 GCOL 0,1
  840 leftx=-scale*xgridinc/2
  850 stopx=1279+scale*xgridinc/2
  860 boty=-scale*ygridinc/2
  870 stopy=1023+scale*ygridinc/2
  880 REPEAT
  890 sx=leftx:sy=boty
  900 REPEAT
  910 PROCdrawshape(sx,sy,scale)
  920 sx=sx+scale*xgridinc
  930 sy=sy+scale*yshift
  940 key$=INKEY$(0)
  950 UNTIL sx>stopx OR key$=" "
  960 boty=boty+scale*ygridinc
  970 leftx=leftx+scale*xshift
  980 IF leftx>0 THEN leftx=leftx-scale*
xgridinc:boty=boty-scale*yshift
  990 UNTIL boty>stopy OR key$=" "
 1000 comms$="SRTPQ"
 1010 GCOL 3,1
 1020 ENDPROC
 1030 DEF PROCclock(steps)
 1040 IF atvertex THEN line=nextl?vertex
:PROCmoveontoline:linestep=0
 1050 PROCmovealong(steps)
 1060 ENDPROC
 1070 DEF PROCanticlock(steps)
 1080 IF atvertex THEN line=prevl?vertex
:PROCmoveontoline:linestep=stepsonline
 1090 PROCmovealong(-steps)
 1100 ENDPROC
 1110 DEF PROCmoveontoline
 1120 LOCAL xdiff,ydiff,xsteps,ysteps
 1130 cline=corrl?line
 1140 linestart=prevv?line:linefinish=ne
xtv?line
 1150 corrls=nextv?cline:corrlf=prevv?cl
ine
```

Continued ▶

◀ McGregor & Watt's listing 1 continued

```
 1160 xdiff=x(linefinish)-x(linestart)
 1170 ydiff=y(linefinish)-y(linestart)
 1180 xsteps=ABS(xdiff) DIV xstep
 1190 ysteps=ABS(ydiff) DIV ystep
 1200 IF xsteps>ysteps THEN stepsonline=
xsteps+1 ELSE stepsonline=ysteps+1
 1210 xinc=xdiff/stepsonline
 1220 yinc=ydiff/stepsonline
 1230 atvertex=FALSE
 1240 ENDPROC
 1250 DEF PROCmovealong(dir)
 1260 linestep=linestep+dir
 1270 IF linestep<=0 THEN linestep=0:atv
ertex=TRUE:vertex=linestart ELSE IF line
step>=stepsonline THEN linestep=stepsonl
ine:atvertex=TRUE:vertex=linefinish
 1280 PROCcursors
 1290 px=x(linestart)+linestep*xinc
 1300 py=y(linestart)+linestep*yinc
 1310 cpx=x(corrls)+linestep*xinc
 1320 cpy=y(corrls)+linestep*yinc
 1330 PROCcursors
 1340 ENDPROC
 1350 DEF PROCcursors
 1360 PROCcursor(px,py,16)
 1370 PROCcursor(cpx,cpy,8)
 1380 ENDPROC
 1390 DEF PROCcursor(x,y,s)
 1400 MOVE x,y
 1410 PLOT 16,-s,0
 1420 PLOT 17,2*s,0
 1430 PLOT 16,-s,-s
 1440 PLOT 17,0,2*s
 1450 ENDPROC
 1460 DEF PROCdeform
 1470 LOCAL t,newvertex,v0,v1,cv0,cv1,x0
,y0,x1,y1,cx0,cy0,cx1,cy1
 1480 newvertex=NOT atvertex
 1490 IF newvertex THEN PROCbreakline EL
SE IF corrv?vertex=255 THEN VDU7:ENDPROC
 1500 v0=prevv?(prevl?vertex):v1=nextv?(
nextl?vertex)
 1510 x0=x(v0):y0=y(v0):x1=x(v1):y1=y(v1
)
 1520 cv0=nextv?(nextl?(corrv?vertex))
 1530 cv1=prevv?(prevl?(corrv?vertex))
 1540 cx0=x(cv0):cy0=y(cv0):cx1=x(cv1):c
y1=y(cv1)
 1550 IF newvertex THEN PROCdrawlineastw
o
 1560 command$=GET$
 1570 REPEAT
 1580 PROCdcomm
 1590 UNTIL command$="F"
 1600 PROCcountcomms
 1610 PROCcursors
 1620 GCOL 0,1:PROCdraw:GCOL 3,1
 1630 PROCcursors
 1640 x(vertex)=px:y(vertex)=py
 1650 x(corrv?vertex)=cpx:y(corrv?vertex
)=cpy
 1660 ENDPROC
 1670 DEF PROCbreakline
 1680 PROCnew(px,py,line,vp+2,lp+2)
 1690 PROCnew(cpx,cpy,cline,vp,lp)
 1700 lastvertex=lastvertex+2
 1710 atvertex=TRUE:vertex=vp-1
 1720 ENDPROC
 1730 DEF PROCnew(x,y,brokline,cv,cl)
 1740 vp=vp+1:lp=lp+1
 1750 x(vp)=x:y(vp)=y
 1760 nextl?vp=lp:prevl?vp=brokline
 1770 nextv?lp=nextv?brokline:prevv?lp=v
p
 1780 prevl?(nextv?lp)=lp
 1790 nextv?brokline=vp
```

Continued ▶

◀ McGregor & Watt's listing 1 continued

```
 1800 corrv?vp=cv
 1810 corrl?lp=corrl?brokline:corrl?brok
line=cl
 1820 ENDPROC
 1830 DEF PROCdrawlineastwo
 1840 PROCcursors
 1850 MOVE x0,y0:DRAW x1,y1
 1860 MOVE cx0,cy0:DRAW cx1,cy1
 1870 PROCdraw:PROCcursors
 1880 ENDPROC
 1890 DEF PROCdcomm
 1900 LOCAL xdir,ydir,cxdir,cydir
 1910 PROCcountcomms
 1920 IF INSTR(dcomms$,command$)=0 THEN
VDU7:command$=GET$:ENDPROC
 1930 IF command$=left$ THEN xdir=-xstep
:ydir=0
 1940 IF command$=right$ THEN xdir=xstep
:ydir=0
 1950 IF command$=up$ THEN xdir=0:ydir=y
step
 1960 IF command$=down$ THEN xdir=0:ydir
=-ystep
 1970 PROCcursors:PROCdraw
 1980 px=px+xdir*coms:py=py+ydir*coms
 1990 cpx=cpx+xdir*coms:cpy=cpy+ydir*com
s
 2000 PROCcursors:PROCdraw
 2010 IF nextcom$="" THEN command$=GET$
ELSE command$=nextcom$
 2020 ENDPROC
 2030 DEF PROCcountcomms
 2040 coms=0
 2050 REPEAT:coms=coms+1:nextcom$=INKEY$
(11)
 2060 UNTIL nextcom$<>command$
 2070 ENDPROC
 2080 DEF PROCdraw
 2090 MOVE x0,y0:PLOT 13,px,py:PLOT 13,x
1,y1
 2100 MOVE cx0,cy0:PLOT 13,cpx,cpy:PLOT
13,cx1,cy1
 2110 ENDPROC
 5000 DATA 3,450,350
 5010 DATA 0,0,3,0,255,0,1,2,0,300
 5020 DATA 0,1,255,1,2,3,300,300
 5030 DATA 1,2,255,2,3,0,300
 5040 DATA 0,2,3,255,3,0,1
 5050 DATA 300,0,300,0
```

Listing 2. New DATA lines will produce the 'flying fish'

```
 5000 DATA 5,450,350
 5010 DATA 0,0,5,0,255,0,1,3,0,300
 5020 DATA 0,1,255,1,2,4,150,300
 5030 DATA 1,2,255,2,3,5,300,300
 5040 DATA 2,3,255,3,4,0,300,0,3,4
 5050 DATA 255,4,5,1,150,0,4,5,255
 5060 DATA 5,0,2
 5070 DATA 300,150,300,0
```

Listing 3. Enhancement to listing 1 that includes PROCcolourfill

```
 95 cmax=50
 96 DIM colnextv vmax,colop cmax,colv
cmax
 225 colp=-1
 420 comms$="QTPCADF"
 540 PROCdrawshape(0,0,1,0)
 560 DEF PROCdrawshape(sx,sy,scale,col)
 572 IF colp=-1 THEN col=0
```

Continued ▶

◀ McGregor & Watt's listing 3 continued

```
   574 IF col<>0 THEN GCOL 0,col:FOR v=0
TO colp:x=x(colv?v):y=y(colv?v):PLOT col
op?v,sx+x*scale,sy+y*scale:NEXT v
   576 GCOL 0,1-col
   715 IF command$="F" THEN PROCcolourfil
l
   760 LOCAL col,r,leftx,sx,sy,s,stopx,st
opy
   875 r=0
   895 col=r
   910 PROCdrawshape(sx,sy,scale,col)
   945 col=(col+1)MOD2
   975 r=(r+1)MOD2
   980 IF leftx>0 THEN leftx=leftx-scale*
xgridinc:boty=boty-scale*yshift:r=(r+1)M
OD2
  1475 colp=-1
  3000 DEF PROCcolourfill
  3010 LOCAL v1,v2,v3,v
  3020 IF colp>-1 THEN VDU7:ENDPROC
  3030 GCOL 0,1
  3040 FOR v=0 TO vp
  3050 colnextv?v=nextv?(nextl?v)
  3060 NEXT v
  3070 v1=start : v2=colnextv?v1 : v3=col
nextv?v2
  3080 REPEAT
  3090 v1=v2:v2=v3:v3=colnextv?v3
  3100 UNTIL FNright(v1,v2,v3)
  3110 PROCpoint(4,v2)
  3120 REPEAT
  3130 IF FNright(v1,v2,v3) THEN IF FNokt
ofill(v1,v2,v3) THEN PROCtrifill(v1,v2,v
3):v2=v1
  3140 v1=v2:v2=v3:v3=colnextv?v3
  3150 UNTIL v1=v3
  3170 GCOL 3,1
  3175 comms$="QTP"
  3180 ENDPROC
  3190 DEF FNright(v1,v2,v3)
  3200 LOCAL x2,x3,y2,y3,r,testy
  3210 x2=x(v2)-x(v1) : y2=y(v2)-y(v1)
  3220 x3=x(v3)-x(v1) : y3=y(v3)-y(v1)
  3230 r=SQR(x2*x2+y2*y2)
  3240 testy=-y2*x3/r+x2*y3/r
  3250 =testy<=0
  3260 DEF FNoktofill(v1,v2,v3)
  3270 LOCAL v,x1,y1,x2,y2,x3,y3,x,y,x21,
y21,x31,y31,tnum,d,s,t,reentrant
  3280 v=colnextv?v3
  3290 IF v=v1 THEN =TRUE
  3300 reentrant=FALSE
  3310 x1=x(v1) : x2=x(v2) : x3=x(v3)
  3320 y1=y(v1) : y2=y(v2) : y3=y(v3)
  3330 x21=x2-x1:y21=y2-y1
  3340 x31=x3-x1:y31=y3-y1
  3350 tnum=x21*y31-y21*x31
  3360 REPEAT
  3370 x=x(v) : y=y(v)
  3380 d=x21*(y3-y)-(x3-x)*y21
  3390 IF ABS(d)<1 THEN reentrant=FALSE E
LSE s=(x31*(y3-y)-(x3-x)*y31)/d : t=tnum
/d : reentrant = (t>1)AND(s>0)AND(s<1)
  3400 v=colnextv?v
  3410 UNTIL reentrant OR v=v1
  3420 =NOT reentrant
  3430 DEF PROCtrifill(v1,v2,v3)
  3440 IF v2=colv?colp THEN PROCpoint(4,v
1) ELSE IF v1=colv?colp THEN PROCpoint(4
,v2) ELSE PROCpoint(4,v1) : PROCpoint(4,
v2)
  3450 PROCpoint(85,v3)
  3460 colnextv?v1=v3
  3470 ENDPROC
  3480 DEF PROCpoint(op,v)
  3490 IF colp=cmax THEN PRINTTAB(0,0);"N
o space":ENDPROC
  3500 colp=colp+1
```

Continued ▶

◀ McGregor & Watt's listing 3 continued

```
  3510 colop?colp=op : colv?colp=v
  3520 PLOT op,x(v),y(v)
  3530 ENDPROC
```

Listing 4. Introduces PROClinedraw

```
    97 dmax=50
    98 DIM decop dmax,dx(dmax),dy(dmax)
   226 decp=-1
   365 lcomms$=left$+right$+up$+down$+"OF
P"
   420 comms$="QTPCADFL"
   635 IF decp>-1 THEN FOR p=0 TO decp:x=
dx(p):y=dy(p):PLOT decop?p,sx+x*scale,sy
+y*scale:NEXT p
   716 IF command$="L" THEN PROCcursors:P
ROClinedraw:PROCcursors
  4000 DEF PROClinedraw
  4010 LOCAL lx,ly,px,py,dop
  4020 IF decp>-1 THEN lx=dx(decp):ly=dy(
decp) ELSE lx=0:ly=0
  4030 dop=4:px=lx:py=ly
  4040 GCOL 3, 1
  4050 PROClcursor
  4060 command$=GET$
  4070 REPEAT
  4080 PROCdeccomm
  4090 UNTIL command$="P"
  4100 PROCldraw:PROClcursor
  4110 ENDPROC
  4120 DEF PROCdeccomm
  4130 PROCcountcomms
  4140 IF INSTR(lcomms$,command$)=0 THEN
VDU7:command$=GET$:ENDPROC
  4150 PROCldraw:PROClcursor
  4160 IF command$="F" THEN PROCfix
  4170 IF command$=left$ THEN px=px-xstep
*coms
  4180 IF command$=right$ THEN px=px+xste
p*coms
  4190 IF command$=up$ THEN py=py+ystep*c
oms
  4200 IF command$=down$ THEN py=py-ystep
*coms
  4210 IF command$="O" THEN dop=9-dop
  4220 PROCldraw:PROClcursor
  4230 IF nextcom$="" THEN command$=GET$
ELSE command$=nextcom$
  4240 ENDPROC
  4250 DEF PROCldraw
  4260 MOVE lx,ly:PLOT dop,px,py
  4270 ENDPROC
  4280 DEF PROCfix
  4290 GCOL 4,0:PROCldraw
  4300 GCOL 3,1
  4310 decp=decp+1
  4320 decop?decp=dop
  4330 dx(decp)=px:dy(decp)=py
  4340 lx=px:ly=py
  4350 ENDPROC
  4360 DEF PROClcursor
  4370 IF dop=4 THEN PROCcursor(px,py,16)
  4380 ENDPROC
```

Check-out our Checksums

IF you're having problems checking your listings, then send an A4 sized stamped addressed envelope plus a cheque or postal order for 50p, and we'll send you a photocopy of a line-by-line checksum value for each program in this month's *Acorn User*. These values can then be matched against your own using Tessie Revivis' BSUM program presented in the August 1985 *Acorn User*, so that you can spot instantly where the erroneous line is.

Cheques and postal orders should be made payable to Redwood Publishing and your envelope should be clearly marked Checksums and sent to Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

See 'Artful manipulations', page 86

Entering *Freehand*

THIS month Chris Steele has extended his *Freehand* program by adding new 'overlays' – short Basic programs which are tagged onto the end of the main program when they are needed. To use them you must first make a few changes to 'P2', the main part of *Freehand*. These changes are presented in listing 1. Load in 'P2' from last month's issue and type in listing 1. Then save the program as 'P2' again. The overlays should be typed in and saved separately, using the name given in the REM statement at line 10000.

Running *Freehand* on an Electron
The following lines must by typed in as part of 'P2':

```
260 REPEAT:PROCgetk
520 PROCgetk
670 PROCgetk
1570 PROCcursor(cr%,crx%): PROCgetk
2390 GOTO 10000
2400 DEF PROCgetk
2410 K% = INKEY(1)
2420 IF K% > = 33 AND K% < = 41
K% = K% + 178:ENDPROC
2430 IF K% > 57 OR K% < 48 ENDPROC ELSE
K% = K% + 152
2440 IF INKEY(1) K% = K% + 10 ELSE IF INKEY (-2)
K% = K% + 20
2450 ENDPROC
```

Also, line 10570 of overlay 'O.CTRL7' should be replaced by:

```
10570 PROCgetk:IF hit% THEN PROCcopy
```

Line 10360 of overlay 'O.CTRL5' should be changed:

```
10360 PROCgetk
```

Keys 0 to 9 can now be used without pressing Caps Lock/Func and can be used with Shift or CTRL. These changes have been made to the program on the monthly cassette and disc.

Using a cassette-based system
Last month we presented a method of converting *Freehand* to run on a cassette-based system. Sadly, because of the large number of extra facilities presented this month, it is not possible to convert the enhanced program to run on tape.

Listing 1. Amendments to be made to 'P2', presented in last month's issue

```
2160 DEF PROCovmenu
2170 IF K%>219 THEN PROCctrled ELSE PRO
Cshfted
2180 ENDPROC
2190 :
2200 DEF PROCctrled
2210 IF K%<223 THEN PROCovly("CTUTILS")
:ENDPROC
2220 PROCovly("CTRL"+STR$(K%-220)):ENDP
ROC
2230 :
2240 DEF PROCshfted
2250 IF K%<213 THEN PROCovly("SHUTILS")
:ENDPROC
2260 PROCovly("SHFT"+STR$(K%-210)):ENDP
ROC
2270 :
2280 DEF PROCoscli(S$)
2290 $(D%+&D0)=S$
2300 x%=X%:y%=Y%
2310 Y%=9:X%=&D0:CALL &FFF7
2320 X%=x%:Y%=y%
2330 ENDPROC
```

Continued ▶

◀ Listing 1 continued

```
2340 :
2350 DEF PROCovly(f$)
2360 IF f$=$F% THEN 10000 ELSE $F%=f$
2370 PROCprt("Loading overlay "+f$)
2380 PROCoscli("LOAD :0.O."+f$+" "+STR$
~(T%-2))
```

Listing 2. This overlay produces an airbrush

```
10000 REM O.SHFT3
10010 :
10020 PROCprt("Airbrush: please define s
pread size")
10030 PROCspread
10040 PROCdensity
10050 PROCprt("Use airbrush now")
10060 REPEAT
10070 PROCcursor(224,32)
10080 IF hit% THEN PROCspray
10090 K%=INKEY(1)
10100 UNTIL K%>199
10110 ENDPROC
10120 :
10130 DEF PROCspread
10140 px%=300:py%=300
10150 REPEAT
10160 PROCcoords
10170 dia%=(X%+Y%)/10
10180 MOVE px%,py%
10190 PROCbox(dia%,dia%)
10200 PROCbox(dia%,dia%)
10210 UNTIL hit%
10220 PROCletgo
10230 PROCbox(dia%,dia%)
10240 rad%=dia%DIV2
10250 ENDPROC
10260 :
10270 DEF PROCdensity
10280 REPEAT
10290 PROCcoords
10300 dny%=(X%+8)DIV25
10310 PROCprt("Hit to fix density at "+S
TR$(dny%))
10320 UNTIL hit%
10330 PROCletgo
10340 PROCbox(dia%,dia%)
10350 ENDPROC
10360 :
10370 DEF PROCspray
10380 GCOL B%,A%
10390 x%=X%+16-rad%
10400 y%=Y%-16-rad%
10410 FOR c%=0 TO dny%
10420 PLOT 69,x%+RND(dia%),y%+RND(dia%)
10430 NEXT c%
10440 ENDPROC
```



Listing 3. This listing will give you hatching

```
10000 REM O.SHFT4
10010 :
10020 PROCprt("Hatching ... hit lower le
ft corner of area first.")
10030 REPEAT
10040 PROCcoords
10050 PROChalfbox(X%,Y%):PROChalfbox(X%,
Y%)
10060 UNTIL hit%
10070 bx%=X%:by%=Y%
10080 PROCletgo
10090 :
```

Continued ▶

◀ *Chris Steele's listing 3 continued*

```
10100 PROCprt("Now the upper right corne
r.")
10110 GCOL 4,0
10120 REPEAT
10130 PROCcoords:MOVE bx%,by%
10140 PROCbox(X%,Y%):PROCbox(X%,Y%)
10150 UNTIL hit%
10160 x%=4*(X%DIV4):y%=4*(Y%DIV4)
10170 bx%=4*(bx%DIV4):by%=4*(by%DIV4)
10180 :
10190 q$=FNinput("Now type the colour se
quence to be used (e.g. 10231)")
10200 REPEAT
10210 T$=FNget("Righthand (R) or lefthan
d (L) hatching")
10220 IF T$="L" THEN PROChatchlh(bx%+x%,
by%+y%,bx%,by%,q$)
10230 IF T$="R" THEN PROChatchrh(bx%+x%,
by%+y%,bx%,by%,q$)
10240 UNTIL T$="L" OR T$="R"
10250 K%=0
10260 ENDPROC
10270 :
10280 DEF PROChatchrh(xa%,ya%,xb%,yb%,c$
)
10290 LOCAL cn%,xs%,ys%,xf%,yf%
10300 cn%=1:xs%=xa%:ys%=yb%
10310 xf%=xa%:yf%=yb%
10320 REPEAT
10330 GCOL 0,VAL(MID$(c$,cn%,1))
10340 cn%=cn%+1:IF cn%>LEN(c$) THEN cn%=
1
10350 MOVE xs%,ys%:DRAW xf%,yf%
10360 IF xs%=xb% THEN ys%=ys%+4
10370 xs%=xs%-4:IF xs%<xb% THEN xs%=xb%
10380 IF yf%=ya% THEN xf%=xf%-4
10390 yf%=yf%+4:IF yf%>ya% THEN yf%=ya%
10400 UNTIL xs%=xb% AND ys%>ya%
10410 ENDPROC
10420 :
10430 DEF PROChatchlh(xa%,ya%,xb%,yb%,c$
)
10440 LOCAL cn%,xs%,ys%,xf%,yf%
10450 cn%=1:xs%=xb%:ys%=yb%
10460 xf%=xb%:yf%=yb%
10470 REPEAT
10480 GCOL 0,VAL(MID$(c$,cn%,1))
10490 cn%=cn%+1:IF cn%>LEN(c$) THEN cn%=
1
10500 MOVE xs%,ys%:DRAW xf%,yf%
10510 IF xs%=xa% THEN ys%=ys%+4
10520 xs%=xs%+4:IF xs%>xa% THEN xs%=xa%
10530 IF yf%=ya% THEN xf%=xf%+4
10540 yf%=yf%+4:IF yf%>ya% THEN yf%=ya%
10550 UNTIL xs%=xa% AND ys%>ya%
10560 ENDPROC
```

Listing 4. This option allows you to plot text on the screen

```
10000 REM O.SHFT5
10010 :
10020 t$=FNinput("Text printing ... type
 in characters for display")
10030 xm=VAL(FNinput("X-magnification"))
10040 ym=VAL(FNinput("Y-magnification"))
10050 style%=FNstyle
10060 PROCprt("Position box then 'HIT' f
or text to be printed.")
10070 REPEAT
10080 PROCcoords
10090 MOVE X%,Y%
10100 PROCbox(LEN(t$)*xm*32,ym*32)
10110 PROCbox(LEN(t$)*xm*32,ym*32)
10120 UNTIL hit%
10130 col%=A%:xp%=X%:yp%=Y%
```

Continued ▶

◀ *Listing 4 continued*

```
10140 PROCsupertext(xp%,yp%,xm,ym,t$)
10150 IF style%=2 THEN PROCoutlined
10160 A%=col%:X%=xp%:Y%=yp%
10170 K%=0:ENDPROC
10180 :
10190 DEF FNstyle
10200 IF FNget("Emphasized (Y/N)")="Y" T
HEN =1
10210 IF FNget("Outlined (Y/N)")="Y" THE
N =2
10220 =0
10230 :
10240 DEF PROCsupertext(xs,ys,mx,my,s$)
10250 LOCAL k%,x%,y%,tx,ty,j%,k%,px,py
10260 OSWORD=&FFF1
10270 px=xs:py=ys:mx=mx*4:my=my*4
10280 FOR k%=1 TO LEN(s$)
10290 X%=&70:Y%=&00:A%=&0A
10300 ?&70=ASC(MID$(s$,k%,1))
10310 CALL OSWORD
10320 ty=ys
10330 FOR j%=X%+8 TO X%+1 STEP-1
10340 PROCstrip(j%)
10350 ty=ty+my
10360 NEXT j%
10370 xs=xs+mx*8
10380 NEXT k%
10390 VDU 24,0;100;1279;1023;
10400 ENDPROC
10410 :
10420 DEF PROCstrip(b)
10430 LOCAL j%
10440 b=?b
10450 tx=xs
10460 FOR j%=7 TO 0 STEP-1
10470 IF (b DIV 2^j%)=0 THEN GOTO 10500
10480 IF style%=2 THEN PROCoublock(tx,ty
,mx,my):GOTO 10500
10490 IF style%=1 THEN PROCemblock(tx,ty
,mx,my) ELSE PROCblock(tx,ty,mx,my)
10500 b=b MOD 2^j%
10510 tx=tx+mx
10520 NEXT j%
10530 ENDPROC
10540 :
10550 DEF PROCblock(a,u,w,h)
10560 GCOL B%,col%+128
10570 VDU 24,a;u;a+w-4;u+h-4;16
10580 ENDPROC
10590 :
10600 DEF PROCoublock(a,u,w,h)
10610 GCOL B%,col%+128
10620 VDU 24,a-w;u-h;a+w+w;u+h+h;16
10630 ENDPROC
10640 :
10650 DEF PROCemblock(a,u,w,h)
10660 PROCblock(a,u,w,h)
10670 PROCblock(a-4,u-4,w,h)
10680 ENDPROC
10690 :
10700 DEF PROCoutlined
10710 style%=0
10720 temp%=col%
10730 col%=0
10740 PROCsupertext(xp%,yp%,xm,ym,t$)
10750 col%=temp%
10760 ENDPROC
```

Listing 5. A fill routine with a difference

```
10000 REM O.SHFT6
10010 :
10020 REPEAT
10030 c$=FNinput("Pattern fill routine .
.. type in colour series e.g. 12132 ZERO
S ARE FATAL")
```

Continued ▶

◀ *Chris Steele's listing 5 continued*

```
10040 UNTIL LEN(c$)>0 AND INSTR(c$,"0")=
FALSE
10050 st=VAL(FNinput("Now the amount of
shift (e.g 0 or -0.5 etc)"))
10060 :
10070 PROCprt("Hit the inside of a total
ly bounded space")
10080 REPEAT PROCcursor(224,32):UNTIL hi
t%
10090 :
10100 x%=X%+16:y%=Y%-16:c%=1
10110 DIM st%(50,1),bl% 10
10120 PROCprt("Filling.. press 'ESCAPE'
for emergency exit")
10130 ta%=A%:tx%=X%:ty%=Y%:tc%=C%
10140 PROCfill(x%,y%)
10150 A%=ta%:X%=tx%:Y%=ty%:C%=tc%
10160 K%=0
10170 ENDPROC
10180 :
10190 DEF PROCfill(x%,y%)
10200 ox%=x%:oy%=y%
10210 p%=1
10220 PROCpush(x%,y%)
10230 REPEAT
10240 PROCpop
10250 IF p%=0 THEN 10420
10260 PROCfl(spx%,spy%)
10270 bx%=maxx%:sx%=minx%:yy%=spy%+4
10280 FOR k%=bx% TO sx% STEP -4
10290 IF POINT(k%,yy%)<>0 THEN 10330
10300 PROCsl(k%,yy%)
10310 PROCpush(maxx%,yy%)
10320 k%=minx%
10330 NEXT k%
10340 yy%=yy%-8
10350 FOR tx%=bx% TO sx% STEP -4
10360 IF POINT(tx%,yy%)<>0 THEN 10400
10370 PROCsl(tx%,yy%)
10380 PROCpush(maxx%,yy%)
10390 tx%=minx%
10400 NEXT tx%
10410 UNTIL FALSE
10420 UNTIL TRUE
10430 ENDPROC
10440 :
10450 DEF PROCpush(sx%,sy%)
10460 p%=p%+1
10470 st%(p%,0)=sx%
10480 st%(p%,1)=sy%
10490 ENDPROC
10500 :
10510 DEF PROCpop
10520 spx%=st%(p%,0)
10530 spy%=st%(p%,1)
10540 p%=p%-1
10550 ENDPROC
10560 :
10570 DEF PROCsl(x%,y%)
10580 PLOT 76,x%,y%
10590 X%=bl%:Y%=bl% DIV 256
10600 A%=&0D:CALL &FFF1
10610 minx%=4*((!bl% AND 65535)DIV 4)
10620 maxx%=(!(bl%+4) AND 65535)
10630 ENDPROC
10640 :
10650 DEF PROCfl(x%,y%)
10660 PROCsl(x%,y%)
10670 nx%=4*((ox%-(oy%-y%)*st)DIV 4)
10680 c%=((minx%-nx%)DIV 4)MOD LEN(c$)
10690 IF c%<1 THEN c%=LEN(c$)+c%
10700 FOR j%=minx% TO maxx% STEP 4
10710 GCOL 0,VAL(MID$(c$,c%,1)):c%=c%+1:
IF c%> LEN(c$) THEN c%=1
10720 PLOT 69,j%,y%
10730 NEXT j%
10740 ENDPROC
```

Listing 6. A useful routine for highlighting

```
10000 REM O.SHFT7
10010 :
10020 col%=VAL(FNinput("Colour of shape
to be traced"))
10030 REPEAT
10040 PROCprt("Enclose right hand edge o
f shape")
10050 REPEAT
10060 PROCcursor(227,32)
10070 UNTIL hit%
10080 PROCprt("Searching for boundary ..
.")
10090 UNTIL FNsearch(X%,Y%)=TRUE
10100 PROCprt("Tracing boundary ...")
10110 PROCtrace(col%,sx%,sy%)
10120 K%=0
10130 ENDPROC
10140 :
10150 DEF FNsearch(x%,y%)
10160 sc%=FALSE
10170 nsc%=FALSE
10180 FOR r%=0 TO -32 STEP -4
10190 FOR c%=0 TO 28 STEP 4
10200 IF POINT(x%+c%,y%+r%)=col% AND POI
NT(x%+c%+4,y%+r%)<>col% THEN sx%=x%+c%+4
:sy%=y%+r%: =TRUE
10210 NEXT ,
10220 PROCprt("No boundary found ...")
10230 =FALSE
10240 :
10250 DEF PROCtrace(scol%,sx%,sy%)
10260 LOCAL dir%,x%,px%,py%
10270 IF POINT(sx%,sy%)=scol% THEN ENDPR
OC
10280 IF POINT(sx%-4,sy%)<>scol% THEN EN
DPROC
10290 GCOL B%,A%
10300 px%=sx%:py%=sy%
10310 dir%=3:PROCincdir
10320 REPEAT
10330 IF POINT(x%,y%)<>scol% THEN PROCpl
otpnt
10340 PROCincdir
10350 UNTIL x%=sx% AND y%=sy%
10360 PLOT 69,x%,y%
10370 ENDPROC
10380 :
10390 DEF PROCincdir
10400 dir%=(dir%+1)MOD4
10410 ON dir%+1 GOSUB 10430,10440,10450,
10460
10420 ENDPROC
10430 x%=px%-4:y%=py%:RETURN
10440 x%=px%:y%=py%+4:RETURN
10450 x%=px%+4:y%=py%:RETURN
10460 x%=px%:y%=py%-4:RETURN
10470 :
10480 DEF PROCdecdir
10490 dir%=(dir%+2)MOD4
10500 ENDPROC
10510 :
10520 DEF PROCplotpnt
10530 PLOT 69,x%,y%
10540 px%=x%:py%=y%
10550 PROCdecdir
10560 ENDPROC
```

Listing 7. This function produces a calligraphic effect

```
10000 REM O.SHFT8
10010 :
10020 PROCprt("Thick pen ... please set
angle and width of pen")
10030 :
10040 GCOL 4,3
```

Continued ▶

◀ Chris Steele's listing 7 continued

```
10050 REPEAT
10060 PROCcoords
10070 x%=X%/2.5:y%=Y%/2.5
10080 MOVE 200,200:DRAW x%,y%
10090 MOVE 200,200
10100 *FX 19
10110 DRAW x%,y%
10120 UNTIL hit%
10130 :
10140 MOVE 200,200:DRAW x%,y%
10150 cr$=FNinput("Type in the colour se
ries to be used")
10160 MOVE 200,200:DRAW x%,y%
10170 :
10180 dt=SQR(ABS(200-x%)^2+ABS(200-y%)^2
)
10190 w%=dt DIV 4
10200 xb=(x%-200)/w%:yb=(y%-200)/w%
10210 fx=0.5*SGN(xb):fy=0.5*SGN(yb)
10220 :
10230 PROCprt("Use pen now")
10240 :
10250 REPEAT:PROCcursor(224,32)
10260 K%=INKEY(1):IF hit% PROClines
10270 UNTIL K%>199
10280 ENDPROC
10290 :
10300 DEF PROClines
10310 REPEAT
10320 px%=X%:py%=Y%:PROCcoords
10330 PROCthkline(px%+16,py%-16,X%+16,Y%
-16)
10340 UNTIL hit%=0
10350 ENDPROC
10360 :
10370 DEFPROCthkline(xb%,yb%,x%,y%)
10380 LOCAL xs%,ys%,j%,k%
10390 k%=1
10400 FOR j%=0 TO w%
10410 GCOL 0,VAL(MID$(cr$,k%,1))
10420 k%=k%+1:IF k%>LEN(cr$) THEN k%=1
10430 xs%=xb*j%+fx:ys%=yb*j%+fy
10440 MOVE xb%+xs%,yb%+ys%
10450 DRAW x%+xs%,y%+ys%
10460 MOVE xb%+xs%+4,yb%+ys%
10470 DRAW x%+xs%+4,y%+ys%
10480 NEXT
10490 ENDPROC
```

Listing 8. A dummy routine for you to insert your own functions

```
10000 REM O.SHFT9
10010 :
10020 K%=0
10030 ENDPROC
```

Listing 9. This overlay gives pixel averaging

```
10000 REM O.CTRL3
10010 :
10020 PROCprt("Pixel averaging ... hit l
ower left corner of area first")
10030 GCOL 4,0
10040 :
10050 REPEAT
10060 PROCcoords
10070 PROChalfbox(X%,Y%):PROChalfbox(X%,
Y%)
10080 UNTIL hit%
10090 px%=X%:py%=Y%
10100 PROCletgo
```

Continued ▶

◀ Listing 9 continued

```
10110 :
10120 PROCprt("now the upper right corne
r")
10130 REPEAT
10140 PROCcoords
10150 PROCbox(X%,Y%):PROCbox(X%,Y%)
10160 UNTIL hit%
10170 :
10180 PROCprt("Averaging area now.")
10190 PROCavarea(px%,X%+px%,py%,Y%+py%)
10200 K%=0
10210 ENDPROC
10220 :
10230 DEF PROCavarea(xa%,xb%,ya%,yb%)
10240 LOCAL w%,ra%,rb%
10250 s%=4:w%=(xb%-xa%)DIV4
10260 DIM ra% w%,rb% w%
10270 FOR yc%=ya% TO yb% STEP 8
10280 FOR xc%=0 TO w%:rb%?xc%=FNaverage(
xa%+xc%*4,yc%):NEXT xc%
10290 IF yc%>ya% THEN FOR xc%=0 TO w%:GC
OL 0,ra%?xc%:PLOT 69,xa%+xc%*4,yc%-4:NEX
T xc%
10300 FOR xc%=0 TO w%:ra%?xc%=FNaverage(
xa%+xc%*4,yc%+4):NEXT xc%
10310 FOR xc%=0 TO w%:GCOL 0,rb%?xc%:PLO
T 69,xa%+xc%*4,yc%:NEXT xc%
10320 NEXT yc%
10330 ENDPROC
10340 :
10350 DEF FNaverage(ax%,ay%)
10360 LOCAL total%,us%,as%
10370 FOR us%=-4 TO 4 STEP 4
10380 FOR as%=-4 TO 4 STEP 4
10390 total%=total%+POINT(ax%+as%,ay%+us
%)
10400 NEXT as%
10410 NEXT us%
10420 =INT(total%/9+0.5)
```

Listing 10. A general-purpose pixel mapping routine

```
10000 REM O.CTRL4
10010 :
10020 PROCprt("General bit mapping ...")
10030 DIMst%(8,1)
10040 tb%=B%:B%=4
10050 :
10060 FOR ca%=0 TO 1
10070 IF ca%=0 t$="Origin" ELSE t$="Dest
ination"
10080 FOR cb%=1 TO 4
10090 PROCprt(t$+" point "+STR$(cb%))
10100 IF cb%=1 PROCfpoint ELSE PROCband(
x%,y%)
10110 st%(cb%+ca%*4,0)=x%:st%(cb%+ca%*4,
1)=y%
10120 NEXT cb%
10130 MOVE x%,y%
10140 DRAW st%(1+ca%*4,0),st%(1+ca%*4,1)
10150 NEXT ca%
10160 FOR ca%=0 TO 1
10170 MOVE st%(1+ca%*4,0),st%(1+ca%*4,1)
10180 FOR cb%=1 TO 4
10190 DRAW st%(cb%+ca%*4,0),st%(cb%+ca%*
4,1)
10200 NEXT cb%
10210 PLOT 13,st%(1+ca%*4,0),st%(1+ca%*4
,1)
10220 NEXT ca%
10230 :
10240 PROCprt("Mapping in progress")
10250 PROCmaparea
10260 K%=0
10270 B%=tb%
10280 ENDPROC
10290 :
10300 DEF PROCmaparea
10310 dsta=SQR((st%(6,0)-st%(5,0))^2+(st
%(5,1)-st%(6,1))^2)
```

Continued ▶

◀ *Chris Steele's listing 10 continued*

```
10320 dstb=SQR((st%(8,0)-st%(7,0))^2+(st
%(7,1)-st%(8,1))^2)
10330 IF dsta>dstb THEN steps%=dsta DIV2
 ELSE steps%=dstb DIV2
10340 fxsa=(st%(2,0)-st%(1,0))/steps%
10350 fxsb=(st%(3,0)-st%(4,0))/steps%
10360 fysa=(st%(2,1)-st%(1,1))/steps%
10370 fysb=(st%(3,1)-st%(4,1))/steps%
10380 txsa=(st%(6,0)-st%(5,0))/steps%
10390 txsb=(st%(7,0)-st%(8,0))/steps%
10400 tysa=(st%(6,1)-st%(5,1))/steps%
10410 tysb=(st%(7,1)-st%(8,1))/steps%
10420 FOR cb%=0 TO steps%
10430 fxa=st%(1,0)+cb%*fxsa
10440 fxb=st%(4,0)+cb%*fxsb
10450 fya=st%(1,1)+cb%*fysa
10460 fyb=st%(4,1)+cb%*fysb
10470 txa=st%(5,0)+cb%*txsa
10480 txb=st%(8,0)+cb%*txsb
10490 tya=st%(5,1)+cb%*tysa
10500 tyb=st%(8,1)+cb%*tysb
10510 PROCmapln:NEXT cb%
10520 ENDPROC
10530 :
10540 DEF PROCmapln
10550 LOCAL ns%,fxs,fys,txs,tys,c%
10560 ns%=1+SQR((txb-txa)^2+(tya-tyb)^2)
DIV4
10570 fxs=(fxb-fxa)/ns%:txs=(txb-txa)/ns
%
10580 fys=(fyb-fya)/ns%:tys=(tyb-tya)/ns
%
10590 FOR c%=0 TO ns%
10600 GCOL0,POINT(fxa+c%*fxs,fya+c%*fys)
10610 PLOT 69,txa+c%*txs,tya+c%*tys
10620 NEXT c%
10630 ENDPROC
10640 :
10650 DEF PROCfpoint
10660 REPEAT
10670 PROCcursor(224,32)
10680 UNTIL hit%
10690 x%=X%+16:y%=Y%-16
10700 ENDPROC
```

Listing 11. A routine for copying an area

```
10000 REM O.CTRL5
10010 :
10020 PROCprt("Copy Area ... touch botto
m left of area to be copied")
10030 DIM ctbl%(1,3)
10040 FOR c%=0 TO 3
10050 ctbl%(0,c%)=0:ctbl%(1,c%)=c%
10060 NEXT c%
10070 :
10080 REPEAT
10090 REPEAT
10100 PROCcoords
10110 PROChalfbox(X%,Y%):PROChalfbox(X%,
Y%)
10120 UNTIL hit%
10130 cfx%=X%:cfy%=Y%
10140 UNTIL FNonscreen(cfx%,cfy%)
10150 PROCletgo
10160 :
10170 PROCprt("Now enclose area to be co
pied.")
10180 GCOL 4,3
10190 REPEAT
10200 REPEAT
10210 PROCcoords
10220 MOVE cfx%,cfy%
10230 PROCbox(X%,Y%):PROCbox(X%,Y%)
10240 UNTIL hit%
10250 xs%=X%:ys%=Y%
10260 UNTIL FNonscreen(cfx%+xs%,cfy%+ys%
)
10270 PROCbox(xs%,ys%)
10280 PROCletgo
10290 :
10300 IF FNget("Change copy colour atrib
```

Continued ▶

◀ *Listing 11 continued*

```
utes (Y/N)")="Y" THEN PROCchangeats
10310 REPEAT
10320 PROCprt("Move to new area then 'HI
T' or select next function.")
10330 REPEAT
10340 PROCcoords:MOVE X%,Y%
10350 PROCbox(xs%,ys%):PROCbox(xs%,ys%)
10360 K%=INKEY(1)
10370 UNTIL hit% OR K%>199
10380 IF hit% PROCcopy(X%,Y%)
10390 UNTIL K%>199
10400 GCOL 4,3
10410 MOVE cfx%,cfy%
10420 PROCbox(xs%,ys%)
10430 ENDPROC
10440 :
10450 DEF PROCchangeats
10460 FOR c%=0 TO 3
10470 ctbl%(0,c%)=VAL(FNget("Use of colo
ur "+STR$(c%)+" (0-4)"))
10480 ctbl%(1,c%)=VAL(FNget("Colour to r
eplace colour "+STR$(c%)+" (0-3)"))
10490 NEXT c%
10500 ENDPROC
10510 :
10520 DEF PROCcopy(x%,y%)
10530 PROCprt("Copying in progress.")
10540 FOR cc%=4 TO ys%-4 STEP 4
10550 FOR c%=4 TO xs%-4 STEP 4
10560 p%=POINT(cfx%+c%,cfy%+cc%)
10570 GCOL ctbl%(0,p%),ctbl%(1,p%)
10580 PLOT 69,x%+c%,y%+cc%
10590 NEXT c%
10600 NEXT cc%
10610 ENDPROC
10620 :
10630 DEF FNonscreen(x%,y%)
10640 IF x%<0 OR x%>1279 THEN =FALSE
10650 IF y%<100 OR y%>1023 THEN =FALSE
10660 =TRUE
```

Listing 12. Allows complex repeat-pattern backgrounds

```
10000 REM O.CTRL6
10010 :
10020 PROCprt("Wallpaper ... touch botto
m left of area to be copied")
10030 REPEAT
10040 REPEAT
10050 PROCcoords
10060 PROChalfbox(X%,Y%):PROChalfbox(X%,
Y%)
10070 UNTIL hit%
10080 UNTIL FNonscreen(X%,Y%)=TRUE
10090 cx%=FNfours(X%):cy%=FNfours(Y%)
10100 PROCletgo
10110 :
10120 PROCprt("Now enclose area to be co
pied.")
10130 GCOL 4,3
10140 REPEAT
10150 REPEAT
10160 PROCcoords:MOVE cx%,cy%
10170 PROCbox(X%,Y%):PROCbox(X%,Y%)
10180 UNTIL hit%
10190 UNTIL FNonscreen(cx%+X%,cy%+Y%)=TR
UE
10200 PROCbox(X%,Y%)
10210 aw%=FNfours(X%):ah%=FNfours(Y%)
10220 aw%=aw%-8:ah%=ah%-8:cx%=cx%+4:cy%=
cy%+4
10230 :
10240 REPEAT
```

Continued ▶

◀ Chris Steele's listing 12 continued

```
10250 d$=FNget("Horizontal (H), vertical
 (V) or no (N) shift")
10260 UNTIL d$="H" OR d$="V" OR d$="N"
10270 IF d$="N" THEN p%=0 ELSE p%=FNperc
ent
10280 IF d$="N" THEN hs%=0:vs%=0
10290 IF d$="H" THEN hs%=FNfours(aw%*p%/
100):vs%=0
10300 IF d$="V" THEN hs%=0:vs%=FNfours(a
h%*p%/100)
10310 PROCcopy(cx%,cy%,0,100,aw%,ah%)
10320 PROCwpaper(aw%,ah%,hs%,vs%)
10330 K%=0
10340 ENDPROC
10350 :
10360 DEF PROCwpaper(w%,h%,xs%,ys%)
10370 PROCprt("Wallpapering in progress.
")
10380 LOCAL ty%,xp%,yp%,txp%,typ%
10390 xp%=0:yp%=0
10400 FOR typ%=100+yp% TO 1023+h% STEP h
%+4
10410 ty%=typ%
10420 FOR txp%=xp% TO 1279 STEP w%+4
10430 PROCcopy(0,100,txp%,typ%,w%,h%)
10440 typ%=typ%-ys%:IF typ%<=-h%+ty% THE
N typ%=typ%+h%
10450 NEXT txp%
10460 xp%=(xp%-xs%)MODw%
10470 typ%=ty%
10480 NEXT typ%
10490 ENDPROC
10500 :
10510 DEF PROCcopy(cfx%,cfy%,ctx%,cty%,w
%,h%)
10520 LOCAL j%,k%
10530 IF ctx%>1279 OR cty%>1023 THEN END
PROC
10540 FOR j%=0 TO h% STEP 4
10550 FOR k%=0 TO w% STEP 4
10560 GCOL 0,POINT(cfx%+k%,cfy%+j%)
10570 PLOT 69,ctx%+k%,cty%+j%
10580 NEXT k%
10590 NEXT j%
10600 ENDPROC
10610 :
10620 DEF FNonscreen(x%,y%)
10630 IF x%<0 OR x%>1279 THEN =FALSE
10640 IF y%<100 OR y%>1023 THEN =FALSE
10650 =TRUE
10660 :
10670 DEF FNpercent
10680 LOCAL t%
10690 REPEAT
10700 t%=VAL(FNinput("Percentage shift")
)
10710 UNTIL t%<=100 AND t%>=0
10720 =t%
10730 :
10740 DEF FNfours(n%)
10750 =(n%DIV4)*4
```

Listing 13. A routine that allows you to move elements from one picture to another

```
10000 REM O.CTRL7
10010 :
10020 REPEAT
10030 q$=FNget("Save or Load an area (S/
L)")
10040 IF q$="L" THEN PROCload
10050 IF q$="S" THEN PROCsave
10060 UNTIL q$="S" OR q$="L"
10070 ENDPROC
10080 :
10090 DEF PROCsave
```

Continued ▶

◀ Continued

```
10100 PROCprt("Save Area ... touch botto
m left of area to be copied.")
10110 REPEAT
10120 PROCcoords
10130 PROChalfbox(X%,Y%):PROChalfbox(X%,
Y%)
10140 UNTIL hit%
10150 px%=X%:py%=Y%
10160 PROCletgo
10170 :
10180 PROCprt("Now enclose area to be sa
ved.")
10190 GCOL 4,3
10200 REPEAT:PROCcoords:MOVE px%,py%
10210 PROCbox(X%,Y%):PROCbox(X%,Y%)
10220 UNTIL hit%
10230 xs%=X%:ys%=Y%:PROCbox(xs%,ys%)
10240 PROCletgo
10250 :
10260 REPEAT
10270 n$=FNinput("Name area should be sa
ved as ")
10280 UNTIL n$<>"" AND LEN(n$)<8
10290 :
10300 PROCprt("Saving "+n$)
10310 f%=OPENOUT("A."+n$)
10320 PRINT#f%,xs%-8,ys%-8
10330 PROCsavearea
10340 CLOSE#f%
10350 GCOL 4,3:MOVE px%,py%:PROCbox(xs%,
ys%)
10360 K%=0
10370 ENDPROC
10380 :
10390 DEF PROCsavearea
10400 FOR j%=4 TO ys%-4 STEP 4
10410 FOR k%=4 TO xs%-4 STEP 4
10420 BPUT#f%,POINT(px%+k%,py%+j%)
10430 NEXT k%,j%
10440 ENDPROC
10450 :
10460 DEF PROCload
10470 n$=FNinput("Name of area to be loa
ded")
10480 DIM col%(1,3)
10490 FOR k%=0 TO 3:col%(0,k%)=0:col%(1,
k%)=k%:NEXT k%
10500 f%=OPENUP("A."+n$)
10510 INPUT#f%,xs%,ys%
10520 IF FNget("Change copy colour atrib
utes (Y/N)")="Y" THEN PROCchangeats
10530 :
10540 PROCprt("Move to new area then 'HI
T' or select new function.")
10550 REPEAT:PROCcoords:MOVE X%,Y%
10560 PROCbox(xs%+8,ys%+8):PROCbox(xs%+8
,ys%+8)
10570 K%=INKEY(1):IF hit% THEN PROCcopy
10580 UNTIL K%>199
10590 ENDPROC
10600 :
10610 DEF PROCcopy
10620 PROCprt("Copying in progress.")
10630 PROCcomplexcopy
10640 PROCprt("Move to new area then 'HI
T'  Press any key to stop.")
10650 ENDPROC
10660 :
10670 DEF PROCchangeats
10680 FOR k%=0 TO 3
10690 col%(0,k%)=VAL(FNget("Use of colou
r "+STR$(k%)+" (0-4)"))
10700 col%(1,k%)=VAL(FNget("Colour to re
place colour "+STR$(k%)+" (0-3)"))
10710 NEXT k%
10720 ENDPROC
10730 :
10740 DEF PROCcomplexcopy
```

Continued ▶

See 'Get a kick out of mule', page 94

◀ Chris Steele's listing 13 continued

```
10750 PTR#f%=10
10760 FOR j%=0 TO ys% STEP 4
10770 FOR k%=0 TO xs% STEP 4
10780 p%=BGET#f%
10790 GCOL col%(0,p%),col%(1,p%)
10800 PLOT 69,X%+k%+4,Y%+j%+4
10810 NEXT k%,j%
10820 ENDPROC
```

Listing 14. This allows you to squash or stretch an area of the picture

```
10000 REM O.CTRL8
10010 :
10020 DIM st%(8,1)
10030 PROCprt("Squasher ... hit lower le
ft of origin area")
10040 :
10050 REPEAT
10060 REPEAT
10070 PROCcoords
10080 PROChalfbox(X%,Y%):PROChalfbox(X%,
Y%)
10090 UNTIL hit%
10100 fx%=X%:fy%=Y%
10110 UNTIL FNonscreen(fx%,fy%)
10120 PROCletgo
10130 :
10140 PROCprt("Now the upper right corne
r.")
10150 GCOL 4,0
10160 REPEAT
10170 REPEAT
10180 PROCcoords
10190 MOVE fx%,fy%
10200 PROCbox(X%,Y%):PROCbox(X%,Y%)
10210 UNTIL hit%
10220 fw%=X%:fh%=Y%
10230 UNTIL FNonscreen(fw%+fx%,fh%+fy%)
10240 PROCbox(X%,Y%)
10250 PROCletgo
10260 :
10270 PROCprt("Hit lower left of destina
tion area")
10280 REPEAT
10290 PROCcoords
10300 PROChalfbox(X%,Y%):PROChalfbox(X%,
Y%)
10310 UNTIL hit%
10320 tx%=X%:ty%=Y%
10330 PROCletgo
10340 :
10350 PROCprt("Now the upper right corne
r.")
10360 GCOL 4,0
10370 PROCscale
10380 REPEAT
10390 PROCcoords
10400 MOVE tx%,ty%
10410 PROCbox(X%,Y%):PROCbox(X%,Y%)
10420 UNTIL hit%
10430 PROCbox(X%,Y%)
10440 PROCscale
10450 tw%=X%:th%=Y%
10460 :
10470 GCOL 4,0
10480 MOVE fx%,fy%:PROCbox(fw%,fh%)
10490 MOVE tx%,ty%:PROCbox(tw%,th%)
10500 PROCprt("Mapping in progress")
10510 PROCmaparea
10520 K%=0
10530 ENDPROC
10540 :
10550 DEF PROCscale
10560 MOVE tx%,ty%
```

Continued ▶

◀ Listing 14 continued

```
10570 DRAW tx%+2*fw%,ty%+2*fh%
10580 mw%=fw%*0.1
10590 mh%=fh%*0.1
10600 FOR j%=1 TO 4
10610 x%=tx%+j%*fw%*0.5
10620 y%=ty%+j%*fh%*0.5
10630 MOVE x%-mh%,y%+mw%
10640 DRAW x%+mh%,y%-mw%
10650 NEXT j%
10660 MOVE tx%,ty%
10670 ENDPROC
10680 :
10690 DEF PROCmaparea
10700 LOCAL k%,j%,xs,ys
10710 xs=fw%/tw%:ys=fh%/th%
10720 FOR k%=0 TO th% STEP 4
10730 FOR j%=0 TO tw% STEP 4
10740 GCOL 0,POINT(fx%+j%*xs,fy%+k%*ys)
10750 PLOT 69,tx%+j%,ty%+k%
10760 NEXT j%
10770 NEXT k%
10780 ENDPROC
10790 :
10800 DEF FNonscreen(x%,y%)
10810 IF x%<0 OR x%>1279 THEN =FALSE
10820 IF y%<100 OR y%>1023 THEN =FALSE
10830 =TRUE
```

Listing 15. This is a printer dump for the Kaga Taxan 910

```
10000 REM O.CTRL9
10010 REM 16 PIN DOT IMAGE
10020 REM 16 PIN 960 DOTS/LINE
10030 REM PATTERN TEST 50%
10040 PROCprt("Printer Dump running.")
10050 :
10060 DIM B%(4,8)
10070 VDU 2
10080 VDU 1,27,1,34
10090 VDU 1,27,1,51,1,23
10100 RESTORE 10250
10110 FOR K%=0 TO 3
10120 FOR I%=1 TO 8
10130 READ B%(K%,I%)
10140 NEXT I%,K%
10150 FOR X%=0 TO 1272 STEP 8
10160 VDU 1,10,1,13
10170 VDU 1,27,1,94,1,17,1,56,1,7
10180 FOR Y%=100 TO 1020 STEP 4
10190 P1%=POINT(X%,Y%):P2%=POINT(X%+4,Y%
)
10200 FOR I%=1 TO 8
10210 VDU 1,B%(P1%,I%),1,B%(P2%,I%)
10220 NEXT:NEXT:NEXT
10230 VDU 3
10240 ENDPROC
10250 DATA 0,0,0,0,0,0,0,0
10260 DATA 17,0,68,0,17,0,68,0
10270 DATA 85,0,85,0,85,0,85,0
10280 DATA 255,255,255,255,255,255,255,2
55
```

Listing 1. Version 1.00 of the music interpreter

```
10 REM Music Interpreter V1.00
20 REM by Joe Telford
30 REM for BBC B/B+ and Electron
40 REM (c) Acorn User November 1985
50 :
60 PROCgetdetails
70 PROCinterpretbody
```

Continued ▶

◀ Joe Telford's listing 1 continued

```
   80 END
   90 DEF PROCgetdetails
  100 INPUT "Program >> "program$
  110 programlength=LENprogram$
  120 ENDPROC
  130 DEF PROCinterpretbody
  140 FOR command = 1 TO programlength
  150 command$=MID$(program$,command,1)
  160 PROCinterpret(command$)
  170 NEXTcommand
  180 ENDPROC
  190 DEF PROCinterpret(command$)
  200 IF command$="C" SOUND1,-15,52,8:EN
DPROC
  210 IF command$="D" SOUND1,-15,60,8:EN
DPROC
  220 IF command$="E" SOUND1,-15,68,8:EN
DPROC
  230 IF command$="F" SOUND1,-15,72,8:EN
DPROC
  240 IF command$="G" SOUND1,-15,80,8:EN
DPROC
  250 IF command$="A" SOUND1,-15,88,8:EN
DPROC
  260 IF command$="B" SOUND1,-15,96,8:EN
DPROC
  270 IF command$="c" SOUND1,-15,100,8:E
NDPROC
  280 IF command$="d" SOUND1,-15,108,8:E
NDPROC
  290 IF command$="e" SOUND1,-15,116,8:E
NDPROC
  300 IF command$="R" SOUND1,0,0,8:ENDPR
OC
  310 PROCerror
  320 ENDPROC
  330 DEF PROCerror
  340 PRINT"Music syntax error!"
  350 END
```

Listing 2. Version 1.00 of the Mule compiler

```
   10 REM Music Compiler V1.00
   20 REM by Joe Telford
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User November 1985
   45 :
   50 PROCgetdetails
   60 PROCstartcoding
   70 PROCcompilebody
   80 PROCendcoding
   90 END
  100 :
  110 DEF PROCgetdetails
  120 linenumber=10:DIM oscli% &100
  130 INPUT "Program >> "program$
  140 programlength=LENprogram$
  150 INPUT "Program name >> "name$
  160 ENDPROC
  170 :
  180 DEF PROCstartcoding
  190 PROCoscli("SPOOL O."+LEFT$(name$,7
))
  200 PROCoutput("REM MUSIC PROGRAM "+na
me$)
  210 PROCoutput("REM AU. MUSIC COMPILER
 V1.00")
  220 PROCoutput(" ")
  230 ENDPROC
  240 :
  250 DEF PROCcompilebody
  260 FOR command = 1 TO programlength
  270 command$=MID$(program$,command,1)
  280 PROCcompile(command$)
```

Continued ▶

◀ Listing 2 continued

```
  290 NEXT command
  300 ENDPROC
  310 :
  320 DEF PROCendcoding
  330 PROCoutput("END")
  340 *SPOOL
  350 ENDPROC
  360 :
  370 DEF PROCcompile(command$)
  380 IF command$="C" PROCoutput("SOUND1
,-15,52,8"):ENDPROC
  390 IF command$="D" PROCoutput("SOUND1
,-15,60,8"):ENDPROC
  400 IF command$="E" PROCoutput("SOUND1
,-15,68,8"):ENDPROC
  410 IF command$="F" PROCoutput("SOUND1
,-15,72,8"):ENDPROC
  420 IF command$="G" PROCoutput("SOUND1
,-15,80,8"):ENDPROC
  430 IF command$="A" PROCoutput("SOUND1
,-15,88,8"):ENDPROC
  440 IF command$="B" PROCoutput("SOUND1
,-15,96,8"):ENDPROC
  450 IF command$="c" PROCoutput("SOUND1
-15,100,8"):ENDPROC
  460 IF command$="d" PROCoutput("SOUND1
-15,108,8"):ENDPROC
  470 IF command$="e" PROCoutput("SOUND1
-15,116,8"):ENDPROC
  480 IF command$="R" PROCoutput("SOUND1
0,0,8"):ENDPROC
  490 PROCerror
  500 ENDPROC
  510 :
  520 DEF PROCoutput(line$)
  530 PRINT STR$linenumber;line$
  540 linenumber=linenumber+10
  550 ENDPROC
  560 :
  570 DEF PROCerror
  580 *SPOOL
  590 PRINT"Compilation error 1"
  600 END
  610 :
  620 DEF PROCoscli(commandline$)
  630 X%=oscli% MOD256
  640 Y%=oscli% DIV256
  650 $oscli%=commandline$
  660 CALL &FFF7
  670 ENDPROC
```

Listing 3. Version 2.00 of the Mule compiler

```
   10 REM Music Compiler V2.00
   20 REM by Joe Telford
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User November 1985
   50 :
   60 REPEAT
   70 PROCgetdetails
   80 PROCstartcoding
   90 PROCcompilebody
  100 PROCendcoding
  110 UNTIL FNend
  120 *FX 3,2
  130 PROCoscli("KEY 0 NEW|M*E. O."+LEFT
$(name$,7)+"|MSAVE "+CHR$34+LEFT$(name$,
7)+CHR$34+"|M*FX3,0|MRUN|M")
  140 *FX 138,0,128
  150 END
  160 :
  170 DEF PROCgetdetails
  180 linenumber=10:loopindex=1
  190 glissando=1:DIM oscli% &100
```

Continued ▶

◀ Joe Telford's listing 3 continued

```
 200 INPUT "Source filename (or RETURN)
 >> "source$
 210 IF source$<>"" PROCopensourcefile
 220 IF source$="" INPUT "Program >> "p
rogram$
 230 IF source$="" programlength = LENp
rogram$
 240 INPUT "Object filename (or RETURN)
 >> "name$
 250 IF name$="" name$=source$
 260 ENDPROC
 270 :
 280 DEF PROCstartcoding
 290 PROCoscli("SPOOL 0."+LEFT$(name$,7
))
 300 PROCoutput("REM MUSIC PROGRAM "+na
me$)
 310 PROCoutput("REM AU. MUSIC COMPILER
 V2.00")
 320 PROCoutput("time=8:volume=-15:temp
o=1")
 330 ENDPROC
 340 :
 350 DEF PROCcompilebody
 360 REPEAT command$=""
 370 REPEAT char$=CHR$BGET#cha%
 380 command$=command$+char$
 390 UNTIL char$=":" OR char$=CHR$(13)
OR char$= " "
 400 command$=LEFT$(command$,LEN(comman
d$)-1)
 410 IF char$<>"" AND command$<>"" PROC
compile(command$)
 420 UNTIL EOF#cha%
 430 ENDPROC
 440 :
 450 DEF PROCendcoding
 460 PROCoutput("END")
 470 PROCoutput("DEFPROCsound(sound)")
 480 PROCoutput("SOUND 1,volume,sound,t
ime*tempo")
 490 PROCoutput("ENDPROC")
 500 PROCoutput("DEFPROCrest")
 510 PROCoutput("SOUND 1,0,0,time*tempo
")
 520 PROCoutput("ENDPROC")
 530 PROCoutput("DEFPROCgap")
 540 PROCoutput("SOUND 1,0,0,0")
 550 PROCoutput("ENDPROC")
 560 *SPOOL
 570 CLOSE#0
 580 ENDPROC
 590 :
 600 DEF PROCcompile(command$)
 610 IF command$="(" PROCcompileloop:EN
DPROC
 620 IF command$=")" PROCcompilenextloo
p:ENDPROC
 630 IF command$="." glissando=0:ENDPRO
C
 640 IF command$="-" glissando=1:ENDPRO
C
 650 IF command$="ff" PROCoutput("volum
e=-15"):ENDPROC
 660 IF command$="f" PROCoutput("volume
=-12"):ENDPROC
 670 IF command$="mf" PROCoutput("volum
e=-10"):ENDPROC
 680 IF command$="mp" PROCoutput("volum
e=-6"):ENDPROC
 690 IF command$="p" PROCoutput("volume
=-4"):ENDPROC
 700 IF command$="pp" PROCoutput("volum
e=-2"):ENDPROC
 710 IF command$="s" PROCoutput("time=2
"):ENDPROC
 720 IF command$=".s" PROCoutput("time=
3"):ENDPROC
```

Continued ▶

◀ Listing 3 continued

```
 730 IF command$="q" PROCoutput("time=4
"):ENDPROC
 740 IF command$=".q" PROCoutput("time=
6"):ENDPROC
 750 IF command$="c" PROCoutput("time=8
"):ENDPROC
 760 IF command$=".c" PROCoutput("time=
12"):ENDPROC
 770 IF command$="m" PROCoutput("time=1
6"):ENDPROC
 780 IF command$=".m" PROCoutput("time=
24"):ENDPROC
 790 IF command$="S" PROCoutput("time=3
2"):ENDPROC
 800 IF command$=".S" PROCoutput("time=
48"):ENDPROC
 810 IF command$="BR" PROCoutput("time=
64"):ENDPROC
 820 IF command$="T1" PROCoutput("tempo
=.5"):ENDPROC
 830 IF command$="T2" PROCoutput("tempo
=1"):ENDPROC
 840 IF command$="T3" PROCoutput("tempo
=2"):ENDPROC
 850 IF command$="R" PROCoutput("PROCre
st"):ENDPROC
 860 sound=FNrntes(command$)
 870 IF sound<0 PROCerror(2) ELSE PROCo
utput("PROCsound("+STR$sound+")"):IF gli
ssando=0 PROCoutput("PROCgap")
 880 ENDPROC
 890 :
 900 DEF PROCcompileloop
 910 PROCoutput("FOR loop"+STR$loopinde
x+" = 1 TO 2")
 920 loopindex=loopindex+1
 930 ENDPROC
 940 :
 950 DEF PROCcompilenextloop
 960 PROCoutput("NEXT")
 970 ENDPROC
 980 :
 990 DEF PROCoutput(line$)
1000 PRINT STR$linenumber;line$
1010 linenumber=linenumber+10
1020 ENDPROC
1030 DEF PROCerror(x)
1040 *SPOOL
1050 PRINT"Compilation error ";x
1060 IF x=2 PRINT "I don't know how to
compile:"command$
1070 IF x=1 PRINT "I can't find that so
urce file"
1080 END
1090 :
1100 DEF PROCoscli(commandline$)
1110 X%=oscli% MOD256
1120 Y%=oscli% DIV256
1130 $oscli%=commandline$
1140 CALL &FFF7
1150 ENDPROC
1160 :
1170 DEF PROCopensourcefile
1180 cha%=("S."+source$)
1190 IF cha%=0 PROCerror(1):ENDPROC
1200 programlength=EXT£cha%
1210 ENDPROC
1220 :
1230 DEF FNend
1240 INPUT "Install this code? (Y/N)> "
answer$
1250 IF INSTR("Yy",LEFT$(answer$,1))>0
THEN =TRUE ELSE =FALSE
1260 :
1270 DEF FNrntes(note$)
1280 LOCAL n$,n,I%
1290 n$=LEFT$(note$,1)
1300 n=INSTR("CDE",n$)*8
```

Continued ▶

See 'Compilers compared', page 167

◀ Joe Telford's listing 3 continued

```
1310 IF n=0 n=INSTR("GAB",n$)*8+28
1320 IF n=28 n=0
1330 IF n$="F" n=28
1340 IF n=0 THEN =-1
1350 n=n+45
1360 n$=MID$(note$,2,1)
1370 IF n$="£" n=n+4
1380 IF n$="b" n=n-4
1390 FOR I%=2 TO LEN(note$)
1400 n$=MID$(note$,I%,1)
1410 IF n$="." n=n-48
1420 IF n$="'" n=n+48
1430 NEXT
1440 IF n>255 =-2
1450 IF n<0 =-3
1460 =n-1
```


DUE to variations in clock speeds that occur between BBC micros, the timings in tables 2 and 3 will vary between individual computers. They should be used as a guide only and not taken as a definitive set of timings for the compilers under review.

Listing 1. The five benchmarks are basically arithmetic loops

```
 10 REM Compiler Benchmark Tests
 20 REM Bruce Smith
 30 REM Compiler/BCOMP/Accerlerator
 40 REM (c) Acorn User November 1985
 50 :
 60 REM Benchmark 1
 70 PRINT "Starting Benchmark 1"
 80 TIME=0
 90 FOR C%=1 TO 1000
100 NEXT C%
110 S%=TIME
120 PRINT"Time taken = ";S%;"/100 secs"
130 REM Benchmark 2
140 PRINT "Starting Benchmark 2"
150 TIME=0
160 N%=0
170 N%=N%+1
180 IF N%<1000 THEN 170
190 S%=TIME
200 PRINT"Time taken = ";S%;"/100 secs"
210 REM Benchmark 3
220 PRINT "Starting Benchmark 3"
230 TIME=0
240 N%=0
250 N%=N%+1
260 Z%=N% DIV N%*N%+N%-N%
270 IF N%<1000 THEN 250
280 S%=TIME
290 PRINT"Time taken = ";S%;"/100 secs"
300 REM Benchmark 4
310 PRINT "Starting Benchmark 4"
320 TIME=0
330 N%=0
340 N%=N%+1
350 Z%=N% DIV 2*3+4-5
360 IF N%<1000 THEN 340
370 S%=TIME
380 PRINT"Time taken = ";S%;"/100 secs"
390 REM Benchmark 5
400 PRINT "Starting Benchmark 5"
```

Continued ▶

◀ Listing 1 continued

```
410 TIME=0
420 FOR N%=&C000 TO &DFFF
430 ?N%=255
440 NEXT N%
450 S%=TIME
460 PRINT"Time taken = ";S%;"/100 secs"
470 END
```

Listing 2. Benchmark six looks at factorials

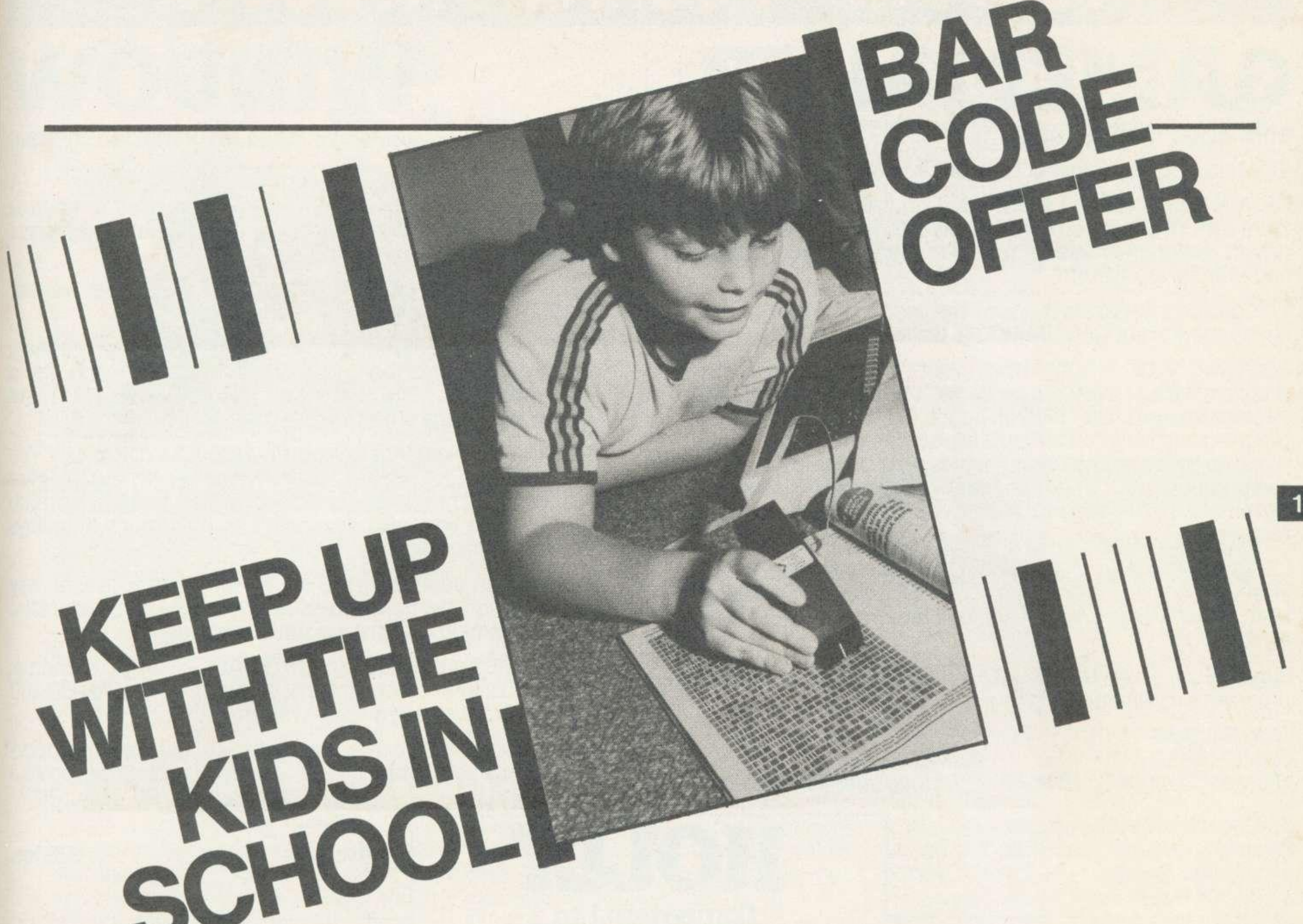
```
 10 REM Benchmark 6 - Factors
 20 REM Bruce Smith
 30 :
 40 TIME=0
 50 FOR X%=0 TO 30
 60 PRINT X%;"! = ";FNfactorial(X%)
 70 NEXT
 80 PRINT"TIME = ";TIME
 90 END
100 :
110 DEF FNfactorial(anynumber)
120 fact=1
130 FOR J% = 1 TO anynumber
140 fact=fact*J%
150 NEXT
160 =fact
```

Listing 3. This benchmark tests trigonometry

```
 10 REM Benchmark 7 - Trigs
 20 REM Compilers
 30 :
 40 TIME=0
 50 MODE 1
 60 FOR X%=0 TO 358 STEP 5
 70 PRINTTAB(0,0);"TAN ";X%;"=";TANRAD
X%
 80 MOVE640+500*COSRADX%,512+400*SINRA
DX%
 90 DRAW640+300*SINRADX%,512+500*COSRA
DX%
100 NEXT
110 CLS
120 PRINT"TIME=";TIME
```

Listing 4. Benchmark eight deals with recursion

```
 10 REM Benchmark 8 - Recursion
 20 REM Compilers
 30 :
 40 TIME=0
 50 MODE1
 60 PROCr(640,512,256)
 70 PRINT"TIME=";TIME
 80 END
 90 DEFPROCr(X%,Y%,R%)
100 IFR%<10 ENDPROC
110 LOCALx1%,x2%,y1%,y2%
120 x1%=X%-R%/2:x2%=X%+R%/2
130 y1%=Y%-R%/2:y2%=Y%+R%/2
140 MOVEx1%,y1%
150 DRAWx2%,y1%:DRAWx2%,y2%
160 DRAWx1%,y2%:DRAWx1%,y1%
170 PROCr(x1%,y1%,R%/2)
180 PROCr(x1%,y2%,R%/2)
190 PROCr(x2%,y2%,R%/2)
200 PROCr(x2%,y1%,R%/2)
210 ENDPROC
```



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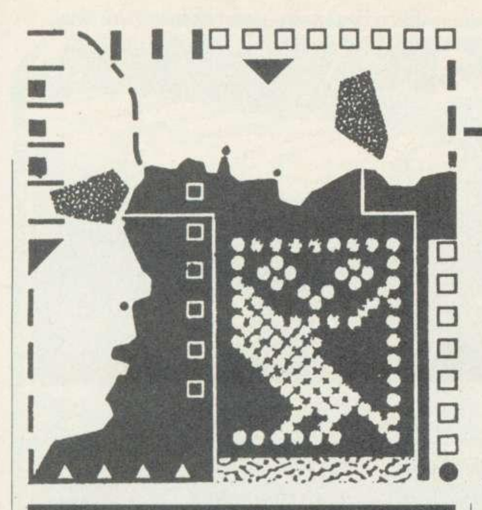
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Bruce Smith bounces around your ideas on compacting programs, speeding up cassette operation and automatic program locking

Key to automatic program locking

USERS of the 0.9 series Acorn DFS might be interested in Jeff Fredricks' techniques for getting automatic locking of programs when they are first saved. Jeff, from Leicester, explains . . .

Acorn's disc filing system allows files to be locked against accidental deletion or overwriting by using the command *ACCESS <filename> L.

This works by setting bit 7 of the file's directory character to a '1' to indicate that the file is locked. However, if we select a directory character which already has bit 7 set then all files subsequently saved will automatically be locked, providing added file security.

The command *DIR <char> is used to select a new directory, where <char> is the new directory character. However, if the command *DIR :!<char> is used, directory <char> will still be selected but bit 7 will be set and files automatically locked, eg, *DIR :!A to select directory 'A' and automatic locking.

This system works on all the 0.9 series of disc operating systems but *not* on the new 1.2 system because it does not allow directory characters under 32 or over 127. Automatic locking can, however, still be achieved by the somewhat 'dirtier' method of directly altering the directory character in the disc system's workspace by the command ?&10C9 = 128 + ASC("char"), where char is the required directory. For example, ?&10C9 = 128 + ASC("$") selects directory '$' and automatic locking.

To turn the system off, simply select a directory using the normal *DIR command.

Fast forward cassette operations

ANDREW Rowlands from Middlesbrough has been delving into his 1.2 operating system and found a useful way of speeding up cassette operations. Rather than turbo charge his cassette recorder, Andrew decided to completely do away with his interblock gaps – not as painful as it may seem! Take it away, Andrew . . .

It would have been ideal if I could have removed the interblock gaps using *OPT 3,x, where x is the inter block gap in 1/10ths of a second. However, this only works on files, so I have copied some of the OSFILE machine code from the MOS into RAM, removed the call that causes the delay, and then intercepted the OSFILE vector at &212 and pointed it at the new RAM-based code.

Assuming that the OSFILE patch is relocated to &C00 you proceed as shown in listing 1. Line 100 does the revectoring, and will need to be reset to &C00 if you press Break. SAVE and *SAVE will work as normal, except you have to hit Escape after the recording has finished. Loading takes place as normal, even on a machine straight after switch on . . .

OK lads and lasses, can anyone tidy Andrew's routine further so that the Escape key need not be pressed?

```
  10 FOR X%=0 TO (&F2
FF-&F27D)
  20 ?(&C00+X%)=?(&F2
7D+X%)
  30 NEXT
  40 FOR Y%=0 TO (&F8
7D-&F7EC)
  50 ?(&C83+Y%)=?(&F7
EC+Y%)
  60 NEXT
  70 ?&C9B=&EA:?&C9C=
&EA
  80 ?&C9D=&EA:?&C77=
&83
  90 ?&C78=&C
 100 ?&212=0:?&213=&C
```

Listing 1. Speeds up cassettes

A compact solution

DISC users will be well aware of the dangers of using *COMPACT with programs present in memory. Because the DFS command uses RAM above PAGE to help with the disc compacting, it's necessary to save your program first or you'll lose it! That is until you try this simple solution sent in by Steve Greenley from Stamford . . .

This seemingly irrevocable problem can be solved by the single command *FX180,n which alters the high byte of the lowest memory location that *COMPACT may use – called OSHWM. During compaction all the memory between this value and the OS's copy of HIMEM is forfeit. If Basic's copy of HIMEM is changed to the new value of OSHWM, then Basic variables and stack contents can also be retained during *COMPACT.

So for a program using screen mode 7 the first lines could read:

```
10 MODE 7
20 HIMEM = &7000
30 *FX180,112          (Note 112 = &70)
```

A program could then operate quite normally and also use *COMPACT successfully.

For other modes simply set HIMEM and OSHWM lower down, ensuring that there is at least one page of memory between them and the bottom of screen memory. For example, for mode 3:

```
10 MODE 3
20 HIMEM = &3400
30 *FX180,52           (Note 52 = &34)
```

This leaves &C00 bytes between OSHWM and the bottom of mode 3 screen memory (&4000). The more bytes left, the faster *COMPACT will work.

Beeb Forum is a platform for ideas, tips and applications relating to the BBC micro and the Electron, intended for experienced programmers to share their thoughts. For every reader's tip published we pay £5 – or more for something special. Contributions should be typed or printed, with substantial listings on cassette. WRITE TO Beeb Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

A VIEW TO A PROGRAM

Ashley Oliver explains how *View* can help relieve the tedium of writing programs

ONE of my main reasons for buying *View* was that I write a lot of machine code programs using assembler, and with a text editor such as *View* you can write the source code as a text file and *EXEC the result to place it in memory as assembler. *View* offers editing facilities vastly superior to the simple line editor of Basic and also produces an easy to read program.

View's facilities are many – search and replace; block move, copy, and delete; line insertion and deletion; tabbing to produce separate label, code, and comment fields; the ability to scroll backwards and forwards through a listing – in fact, the more familiar you become with *View* the more the sheer finger-bruising drudgery of writing programs disappears.

The procedure is simple. Enter *View*. Then write your program. When you're happy, save the resulting text-file and re-enter Basic. *EXEC your text-file and it's ready to assemble (at this stage it's a good idea to save the Basic version as well). There's no need to include line numbers in the *View* version. All you do is make the first line AUTO 100, or any other suitable line number, and then press Escape after you've *EXECed it.

If you decide that you want to edit or amend some machine code you can also reverse the process. Simply *SPOOL to create a text-file and then read this file from *View*. (Use 'READ' rather than 'LOAD' as it is better at coping with non-*View* files.) If you have an assembler listing you can *SPOOL and LIST. If you have a disassembler you can even work from the actual machine code by using *SPOOL and then running your disassembler. If you've not tried this before, here's a tip – before you read the *SPOOLed file into *View*, turn off the automatic formatting. If you don't, you'll get some very strange effects if any of the lines in the *SPOOLed file are longer than *View*'s current line length.

From this it's a fairly logical extension to move on to writing Basic programs from *View* by the same method. Once again, make the first line AUTO and then omit the line numbers as the file is going to be *EXECed anyway. There are some disadvantages as far as Basic's concerned, however. Possibly the most serious is that you can't run it every few lines to see how it's going. Whether this bothers you or not depends upon your programming style. I feel that for any program that's going to be more than a couple of dozen lines long the superior editing facilities are a must: imagine the joy of being able to change a variable name with a few keystrokes! And think how happy your local neighbourhood structuralist will be when he sees a Basic program without any line numbers – not even the possibility of a GOTO, GOSUB or ON construction!

The lack of line numbers is by no means a handicap – in fact, when it comes to copying or moving a block, it's a great advantage. You can, then, write Basic programs in *View*, but what you can't do – as yet – is *SPOOL a Basic file and use *View* to edit it, because of those unmentionable line numbers. You can load a Basic file, *SPOOL and LIST to convert it into an ASCII file; *View* to read the ASCII file – but the line numbers will still be there. So you either have to plough through the entire text deleting the line numbers manually, or you have to sort the line numbers out for yourself every time you make an amendment. Less than satisfactory!

This brings me to listing 1 on page 127. It is a utility which will copy an ASCII file, but in so doing will ignore any spaces or numbers immediately following a carriage return. This means that if you produce an ASCII file version of a Basic program and then hit it with this utility, you'll create another ASCII file which contains your Basic program, but without line numbers.

Now we have the tools to produce an ASCII file that can be read by *View*, edited freely, and, with the addition of an AUTO, *EXECed back to produce a revised Basic program. This utility also solves the partial-renumber problem, but I'll leave you to worry about the mechanics of that one.

Type in listing 1, save it (in case of typing errors) and then run it to assemble the code. I've written it to assemble from &1700 onwards and it is *not* relocatable. However, if you would like it to reside somewhere else then the only change required is to the value of base% in line 90. Having assembled it in the location of your choice *SAVE the assembled code. I called it

LINEOUT, but the name is up to you. The assembled code is &FC bytes long and the execution address is &14 bytes from the start. So you should type something like:

*SAVE LINEOUT <base%> +00FC <base%+&14>

Now to test it. As it is intended to be a library utility you'll probably want to ensure that the code is in the current directory or library. If it is, it can be called by name alone otherwise you will have to *RUN it. The syntax is:

*LINEOUT <filein> <fileout>

where 'filein' is the ASCII file with line numbers and 'fileout' will be your chosen name for the new ASCII file without line numbers. I have included some error checking, but I have great faith in the ability of *Acorn User* readers to find errors that have never occurred to me. One potential disaster which I haven't trapped would happen if (a) filein isn't locked, (b) fileout already exists (possibly from an earlier version), or (c) you get the parameters in the wrong order. I give you fair warning, your source file will be wiped.

Let's see how it all works, then. I take little credit – most of the hard work is done by OS routines.

OSARGS performs various functions. In this case it is entered with A%=1 and Y%=0, which returns the address of the rest of the command line in a zero page control block pointed to by X%, as described in the DFS manual. Its purpose is to allow access to any parameters following *RUN<fsp> with a disc system.

GSINIT is not documented by Acorn as such, but is mentioned in the *Advanced User Guide*. It is entered with an address in &F2,&F3 plus an offset in Y% if required. The address given should point to a string. Whether the string is delimited by spaces or quotes is determined by the clearing or setting of the C flag. In either case a carriage return will be accepted as an alternative termination. On exit from GSINIT, (&F2),Y points to the first character in the string after any leading spaces have been ignored. A% contains this character and the Z flag indicates an error (empty string). Essentially, then, this routine carries out all the preparatory work required for reading a string.

GSREAD is a routine that may be used to read a string after a call of GSINIT. It finds the next character by using an LDA (&F2),Y so the contents of &F2,&F3 and those of the Y register should have been preserved since the last call of GSINIT or GSREAD. On exit from GSREAD, A% contains the character read, while Y% points to the next character, and the carry flag will flag the end of the string if reached. X% is preserved. The use of GSINIT and GSREAD thus make handling string input relatively simple.

OSFIND is used to open or close files. If A% is zero the effective action is that of Basic's CLOSE #Y%. Here it is used with Y%=0 to close all files at the end of the program. If A% is non-zero a file is to be opened. A%=&40 for OPENIN, &80 for OPENOUT, and &C0 for OPENUP. In this case X% and Y% should point to the name of the file to be opened (which must be terminated by a carriage return). On exit A% contains the channel number assigned or zero if the file could not be opened.

OSBPUT and OSBGET perform much the same functions as Basic's BGET# and BPUT#. The channel number should be in Y%, and the byte is transferred through the accumulator. For OSBGET the carry flag will be set on exit if EOF# is true (in this case the byte in A% is invalid).

```
FJ *.......*.......*.......*.......*.......*.(
.. *.......*.......*.......*.......*.......*.(
  1000 gsinit=&FFC2
  1010 gsread=&FFC5
  1020 osbget=&FFD7
  1030 osbput=&FFD4
  1040 osfind=&FFCE
  1050 osargs=&FFDA
  1060 base%=&1700:filein%=&1700:fileout%=&
 170A
  1070 $filein%="         "
  1080 $fileout%="         "
  1090 FOR I%=0 TO 3 STEP 3
  1100 P%=base%+&14
  1110 [OPT I%
  1120 LDX #&70 \ Use osargs to get address
  of rest
  1130 LDY #0   \ of command line
  1140 LDA #1
  1150 JSR osargs
  1170 LDA &70 \ Store this address in (&F2
 ) ready
  1180 STA &F2 \ for gsinit
  1190 LDA &71
  1200 STA &F3
```

An example of editing an assembly language listing in *View*

So to the routine of listing 1. Line 90 sets the address at which the code should be assembled. Space for the names of the input and output filenames is reserved in lines 110 and 120. Note that there are nine spaces between the quotes. OSFIND requires filenames to be terminated with a carriage return and the string indirection operators are a convenient way of inserting these.

Lines 160 to 190 use OSARGS to write the address of the rest of the command line into &70-&73 (unless you are one of the few with a second processor, the two higher bytes are irrelevant).

This address is copied to &F2,&F3 in lines 200 to 230. You can't use OSARGS to write the address to these locations directly because OSARGS returns a four-byte address and would thus corrupt &F4,&F5.

Lines 240 to 260 prepare to read the rest of the command line using GSINIT. If the Z flag is set indicating an empty string it produces a syntax error.

Lines 340 to 390 copy the first parameter into the space for a filename reserved at the beginning of the assembly. If it is too long a bad filename error is produced.

The process is repeated for the second parameter in lines 450 to 560. As I haven't tampered with &F2,&F3 or the Y register since the last call of GSREAD, GSINIT can be called immediately to re-initialise and get rid of any spaces between the two parameter strings. Once again it checks for a syntax error (missing parameter) and a bad filename (string too long for a filename). Note that in neither case is the string checked other than for existence and length – if it's a bad filename for some other reason this will produce the appropriate error when you try to open the files later.

Lines 580 to 690 open the input file for reading and the output file for writing by calling OSFIND. The respective channel numbers are stored in &70 and &71.

The main body of the program starts at line 700. A byte is read and, although I won't bother to say so from here on, every time a byte is read a check is made for EOF.

This byte is then written to the output file. A check is made to see whether it was a carriage return (&D); if it wasn't it goes back to the beginning and repeats. If it was you pass on to line 710. From here it reads bytes repeatedly checking to see if they are spaces (&20) or numbers (&30-&39). When it finds a byte that isn't one of these things it writes to the output file and returns to the beginning.

The only exit from this part of the routine is when the end of the input file is reached. Once this happens it branches to 'exit' where it only remains to use OSFILE to close all the files and then return. Incidentally, you might care to replace lines 910 and 920 with a JMP entry – it won't make any difference to the assembly (three bytes in either case) but it's two cycles faster. I tend to avoid absolute jumps simply because a lot of the code I write has to be relocatable. If you wanted to, it would be fairly easy to rewrite this routine to be relocatable, but you would have to dispense with the space for the filenames, which would mean either allocating the program &14 bytes of absolute workspace or making it slightly more complex. As it stands the program uses only four bytes of absolute space – &70-&73.

Listing 1. Ashley Oliver's program for writing machine code in *View*

```
   10 REM Lineout
   20 REM by Ashley Oliver
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User November 1985
   50 :
   60 gsinit=&FFC2:gsread=&FFC5
   70 osbget=&FFD7:osbput=&FFD4
   80 osfind=&FFCE:osargs=&FFDA
   90 base%=&1700
  100 filein%=&1700:fileout%=&170A
  110 $filein%="          "
  120 $fileout%="          "
  130 FOR I%=0 TO 3 STEP 3
  140 P%=base%+&14
  150 [OPT I%
  160 LDX #&70
  170 LDY #0
  180 LDA #1
  190 JSR osargs
  200 LDA &70
  210 STA &F2
  220 LDA &71
  230 STA &F3
  240 CLC
  250 JSR gsinit
  260 BNE over1
  270 .err1:]
  280 $P%=CHR$0+CHR$16+"Syntax is:- LINE
OUT <filein> <fileout>"+CHR$0
  290 P%=P%+42
  300 [OPT I%
  310 .over1
  320 LDX #0
  330 .l1
  340 JSR gsread
  350 BCS over2
  360 STA filein%,X
  370 INX
  380 CPX #&B
  390 BNE l1
  400 .err2:]
  410 $P%=CHR$0+CHR$(&CC)+"Bad filename"
+CHR$0
  420 P%=P%+16
  430 [OPT I%
  440 .over2
  450 CLC
  460 JSR gsinit
  470 BEQ err1
  480 LDX #0
  490 .l2
  500 JSR gsread
  510 BCS over3
  520 STA fileout%,X
  530 INX
  540 CPX #&B
  550 BNE l2
  560 BEQ err2
  570 .over3
  580 LDA #&40
  590 LDX #(filein% MOD &100)
  600 LDY #(filein% DIV &100)
  610 JSR osfind
  620 STA &70
  630 BEQ err3
  640 LDA #&80
  650 LDX #(fileout% MOD &100)
  660 LDY #(fileout% DIV &100)
  670 JSR osfind
  680 STA &71
  690 BEQ err4
  700 .entry
  710 LDY &70
  720 JSR osbget
  730 BCS exit
  740 LDY &71
```

Continued ►

◄ *Continued*

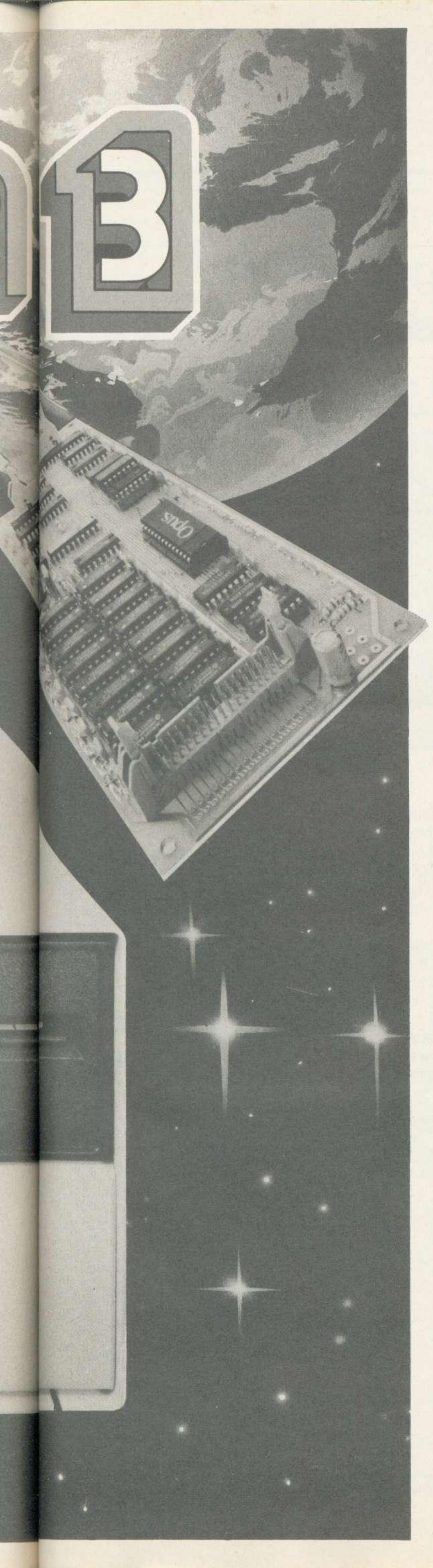
```
  750 JSR osbput
  760 CMP #&D
  770 BNE entry
  780 .l3
  790 LDY &70
  800 JSR osbget
  810 BCS exit
  820 CMP #&20
  830 BEQ l3
  840 CMP #&30
  850 BMI l4
  860 CMP #&3A
  870 BCC l3
  880 .l4
  890 LDY &71
  900 JSR osbput
  910 SEC
  920 BCS entry
  930 .exit
  940 LDY #0
  950 TYA
  960 JSR osfind
  970 RTS
  980 .err3:]
  990 $P%=CHR$0+CHR$(&D6)+"File not foun
d"+CHR$0
 1000 P%=P%+18
 1010 [OPT I%
 1020 .err4:]
 1030 $P%=CHR$0+CHR$(&C0)+"Can't open fi
le"+CHR$0
 1040 NEXT
```

How to enter and check *Lineout*

LINEOUT is a short assembly language listing. It should be typed in exactly as printed. To make sure that you have entered it correctly add the lines below to the program. These form a checksum which will report any errors in the assembled code.

If the message 'Listing is OK' appears, save the correct machine code routine as described in the main article.

```
 1200 REM Checksum
 1210 t%=0
 1220 FOR byte% = &1700 TO
&1786
 1230 t%=t%+?byte%:NEXT
 1240 IF t%<>12778 PRINT
"Error in 10000 - 10500":
END
 1250 t%=0
 1260 FOR byte% = &1787 TO
&17E8
 1270 t%=t%+?byte%:NEXT
 1280 IF t%<>12961 PRINT
"Error in 10510 - 10990":
END
 1290 PRINT "Listing is OK"
```



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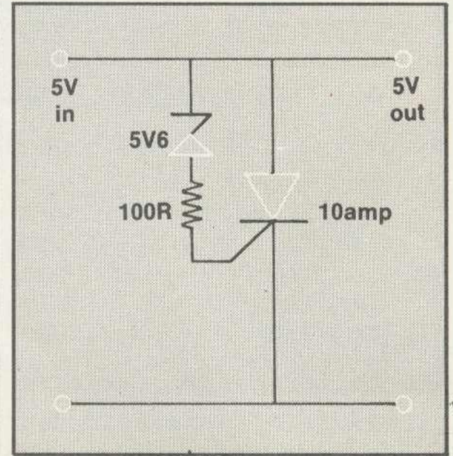
Mike Barwise is in the hot seat again, answering your Atomic queries and passing on readers' bright ideas and useful programs

£10 Low cost power supply upgrade

MANY of you have asked about upgrading the Atom power supply, and have been put off by the high cost of high power (5A) regulators. A solution to the problem, which incidentally could prove more reliable long term, has been designed by Richard Cripps, a technician working on the 1 megavolt electron microscope at Oxford University. They use Atoms a lot so Richard was prompted to come up with this circuit to prevent them catching fire.

Instead of the massive, expensive 5A regulator, Richard's design uses a 7805 1A (yes, one amp!) regulator to control a high current transistor. The suggested transistor (TIP 2955) is only about 80p and will carry 15A. In the Atom's working region of less than 5A including expansion, it should be almost indestructible. The transistor will need a heat sink, but again, as the transistor is such a high power device, bolting it to a metal power supply case should prove adequate for all but the most arduous conditions.

If you are worried about breakdown, a zener-thyristor protection circuit can be fitted to the output. This does not cost much, and is, I suppose, a good idea, as should the transistor go short circuit the full unregulated supply would be presented to the load. The same applies to three-terminal regulators in conventional use.



This device will protect the computer if the power supply should fail

It is probably a good idea to fit a silicon transient suppressor across the input to the regulation circuit, to help eliminate switching spikes, and of course a fuse of about 7.5A should be fitted. The whole lot will probably cost you about the same as a 5A three-terminal regulator.

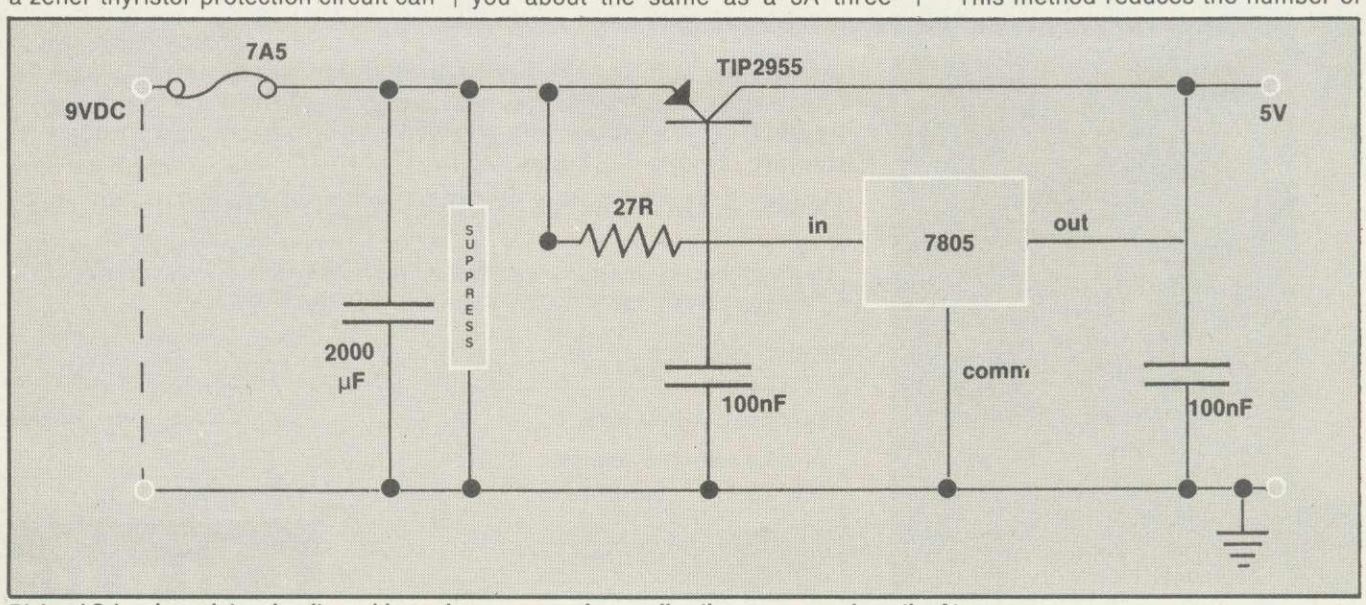
A final note: be very particular about the mains side of your power supply. I can't count the number of transformers I've seen held down with araldite, insulated with sellotape and wired with stripped-down ribbon cable. I think the gods watch over amateur electricians, because some of my friends are still alive! Get the mains side looked at by your local electrician, or better still ask him first.

£10 A method of elimination

DAVID Grindrod, whom Atom users may remember for his EPROM programmer (*Everyday Electronics,* Feb '83) has sent me a nice set of programs for solving simultaneous equations by Gaussian elimination. He writes . . .

Simultaneous equations occur in many fields ranging from nuclear physics to zoology. There are a number of methods that can be used to solve them but one of the most efficient and easily understood is the systematic version of the method we all learn at school – Gaussian elimination.

This method reduces the number of



Richard Cripps' regulator circuit provides a cheap means of upgrading the power supply on the Atom

unknowns (x,y,z . . . etc) to one by forming a new set of equations from the previous set with one less unknown than before. Eventually only one is left. This answer is then put into the last but one set of equations which had two unknowns. However, one has now been solved thus allowing us to find the other: we now know two of the unknowns. This procedure of back substitution is repeated until all the unknowns have been solved.

An advantage of this method is the ease with which it can be solved by a small algorithm (listing 1). The REM statements explain what each section of the program does. The use of variables is:

Array %ZZ holds the initial and subsequently derived equations
P is the next free array element of %ZZ
M is the number of initial equations
B is the array element position for the start of the equation currently being processed
Array %WW holds the calculated values for the unknowns

. . . The result is displayed as a value for each variable in the input sequence. David points out that only the first seven decimal places are accurate.

The listing contains excellent examples of efficient programming. I think that several of the subroutines could find alternative uses and I would be interested in other readers' applications and adaptations.



Revolutionary rotation

THIS little program from Martin Coffey (listing 2) rotates a string leftwards through one complete revolution. Its effect shows up best on strings containing spaces and not over 32 characters long. It can be modified in many ways for specific needs.

The crucial line is 180, which copies the string back on itself. Thé idea has many other uses as well, and is worth filing for reference.

This column is your contact point with other Atom users, but don't forget to read the rest of the magazine as well – lots of ideas can be transported from the BBC micro. If you have a question ask it – maybe another reader knows the answer.

If you've invented a routine or discovered a hardware modification for the Atom here's a chance to show your originality and win some cash. Send your idea to: Atom Forum, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH.

```
 10 INPUT"HOW MANY EQUATIONS"M

 20 REM
 30 REM CALCULATE TOTAL ARRAY STORAGE REQUIRED
 40 A=0
 50 FORC=M TO1 S.-1
 60 A=C*(C+1)+A
 70 NEXT
 80 FDIM %ZZA,%WW(M-1)

 90 REM INPUT INTIAL EQUATIONS & SET P
100 @=0;FORI=1TOM;FORJ=1TOM+1;P."C("I","J")=";FINPUT%A
110 %ZZ((I-1)*(M+1)-1+J)=%A;NEXT;NEXT
120 P=M*(M+1)

130 REM PROCESS LOOP
140 B=0
150 FORN=M TO1 S.-1
160 GOS.a;GOS.c
170 B=B+((N+1)*N);NEXT
180 GOS.d
190 D=1;@=0
200 FORA=M-1TO0S.-1;P."X("D")=";FP.%WWA';D=D+1;NEXT
210 END

220 REM SORT EQUATIONS INTO DESCENDING MAGNITUDE OF X(1)
230a FORA=B TO((N+1)*N-1+B)S.N+1
240 IF %ZZA>%ZZB GOS.b
250 NEXT;R.
260b FORC=B TON+B;%A=%ZZC;%ZZC=%ZZ(C+A);%ZZ(C+A)=%A
270 NEXT;R.

280 REM FORMATION OF PIVOTAL EQUATIONS
290c FORC=B+N+1 TO N*(N+1)-1+B S.N+1
300 %A=-%ZZC/%ZZB
310 FORD=C+1 TOC+N
320 %ZZP=%ZZ(B+D-C)*%A+%ZZ(D)
330 P=P+1;NEXT;NEXT;R.

340dREM WORK OUT CO-EFF.
350 FORA=0TOM-1;%WWA=0;NEXT
360 B=B-2;%WW0=%WW0+(%ZZ(B+1)/%ZZB)
370 FORN=2TOM
380 B=B-N*(N+1)
390 %A=%ZZ(N+B)
400 FORD=1TON-1

410 %A=%A-(%ZZ(D+B)*%WW(N-D-1))
420 NEXT;%WW(N-1)=%WW(N-1)+(%A/%ZZB);NEXT
430 R.
```

Listing 1. David Grindrod's set of programs to solve simultaneous equations

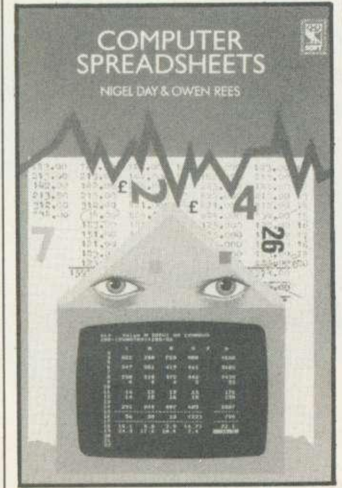
```
100 REM STRING ROTATION
110 REM BY MARTIN COFFEY.
115 P.$12
120 R=£8300;REM"ROTATING LETTER" STRING
130 O=£8400;REM "ORIGINAL INPUT" STRING
140IN." ORIGINAL STRING"$O;REM SPACES ENHANCE EFFECT.
145L=LEN(O);REM USED FOR ROTATING NEXT LETTER ON.
150P.$12;?£E1=0;REM CLEAR SCREEN AND CURSOR
160D=3*L;REM SET NUMBER OF ROTATIONS,3 HERE.
170F.I=0 TO D;REM INSERT WAIT STATEMENTS AS NEEDED.
173 WAIT;WAIT;WAIT
175P.$30$O;REM PRINT STRING AT TOP OF SCREEN.
180$R=$O;$R+1="";$O+L=$R;$O=$O+1;REM ROTATING ROUTINE
190N.
200?£E1=£80;END;REM RESET CURSOR AND END
```

Listing 2. Program to rotate a string leftwards through one complete revolution

What to look for in a spreadsheet

ANYONE struggling over which spreadsheet package to buy could do worse than read *Computer Spreadsheets*, published by BBCSoft at £6.95.

The book covers three spreadsheets – the BBC's own *Ultracalc 2* for the BBC micro, *Visicalc* and *Lotus 1-2-3* (which don't run on the Beeb). It suggests what to look for in a package and how to get the most out of a program.



Compact interface enhances Nucleus

COMPACT Software has enhanced its Nucleus program generator software with the release of an 'interfacer'. This 'massages' data from Nucleus programs so that it can be used with a wide range of other proprietory packages – such as *Wordstar* or *Lotus 1-2-3*. Price is £125.

Meanwhile Compact's MD, Neville Potter, says that relationships with Acorn, who bundle in Nucleus with the Z80 second processor, are now back on a firmer footing after Compact was left in the dark for several weeks about the future of the Nucleus deal.

Compact Software, 1 Paper Mews, 330 High Street, Dorking, Surrey RH4 1QX.

Dial-a-program

BRITISH Telecom has entered the business of electronic software distribution.

EDOS (Electronic Distribution of Software) means that programs are transmitted over telephone lines to 'satellite' terminals in shops, where they can be downloaded onto blank tape or disc for the customer.



BENEATH the smart 'colour-matched slimline processor cabinet' and the 'ergonomically streamlined keyboard' of this Oak Personal Computer lurks a simple BBC micro.

Various Oak options are available, ranging from a £1,325 system, with BBC B+ mother-board, dual double-sided disc drives, Z80 second processor and business software, down to £87 for just the keyboard and processor casings.

There's also a £135 Oak modem, which can be installed inside the case.

Details from Oak Universal, 20 Crofters Green, Green Lane, Idle, Bradford BD10 8RR.

Home banking for business

THE Bank of Scotland has expanded its home banking service and is now offering an interest-bearing investment account to home and business customers.

The Home and Office Banking Investment Account lets micro-owning customers tap into the Bank's computer network through a closed section of Prestel and obtain balances, pay bills and generally run their account from home.

Previously its home banking service only offered a current account, but it now joins the Midland Bank in allowing micro-owning customers to switch money from current to deposit accounts easily and quickly for the extra interest.

The Bank of Scotland is also offering money management by computer to business customers using the home banking service; facilities include the display of available cleared funds and the ability to make external payments of up to £25,000.

The cost is £2.50 per month, plus normal Prestel charges.

Meanwhile Prestel Citiservice has added two new facilities to its pages. Portfolio management allows subscribers to input investment details and receive up-to-the-minute valuations based on latest trading prices, and a tax management feature will calculate personal tax liability and perform 'what if' predictions. Details from Prestel on 01-583 2790.

Business user group launched

PARK Computer Services has launched a user group, ABUG, to cater for all businesses using Acorn machines.

Membership at £6.50 for the first six months entitles you to a regular newsletter and – hopefully – discounts on business software. ABUG is also negotiating special insurance schemes and maintenance contracts.

The lack of any suitable maintenance contract for Park Computer Services' BBC micros prompted the company to start the user group.

The group has just been launched and doesn't have too many members at the moment, but the variety of BBC micro-based systems represented is encouraging, said ABUG's Jim Doyle.

Anyone interested can contact ABUG at Park Computer Services, 66 Amblecote Road, London SE12 9TW.

TOP 10 BUSINESS/UTILITY CHART

Title	Publisher	Cassette	Disc	ROM	Electron	Shadow on B+	6502	Econet
1 Mini Office	Database	£5.95	£7.95 £9.95†	—	£5.95	*	*	—
2 Wordwise Plus	Computer Concepts	—	—	£56.35	—	—	Yes	—
3 Wordwise	Computer Concepts	—	—	£56.35	—	—	—	—
4 View	Acornsoft	—	—	£59.80	£29·95	*	*	*
5 Masterfile 2	Beebugsoft	—	£19	—	—	Yes	Yes	—
6 Database	Acornsoft	£11.90	£15.35	—	—	—	—	—
7 Printmaster	Computer Concepts	—	—	£33.35	—	*	Yes*	—
8 Accounts (series)	Acornsoft	—	£24.95	—	—	—	—	—
9 Discmaster	Beebugsoft	—	£19.00	—	—	Yes	Yes	—
10 ViewSheet	Acornsoft	—	—	£59.50	£29.95	Yes	Yes	Yes

Compiled by RAM/Computer from a panel of specialist dealers
*Contact publisher: Database, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY 061-480 0171; Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX (0442) 63933; Acornsoft, 645 Newmarket Road, Cambridge CB5 8PD (0223) 214411; Beebugsoft, PO Box 50, St Albans, Herts. †3in disc


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CP/M CORNER

Edward Brown and Richard Clement present their monthly mélange for business users who want to get the most out of the Z80 second processor

Members of the board

THE CP/M UG (UK) is now running a bulletin board for its members. It is possible to access it with only a modem and a terminal but file transfer facilities are available only to those who are running a package that supports the Christianson protocol as used in *UKM7*, available from the Users Group library. The bulletin board runs between 6.30 and 10.30 at night and at weekends and can be reached on (0767) 50511. When the bulletin board is not running you can leave a message giving your name, CP/M Users Group membership number and password and you will be added to the board. Or you can write to Alan Walker, 31a Church Street, Gamlingay, Nr Sandy, Beds, giving the relevant details.

Mushrooming groups

THERE are starting to be more and more local user groups – their details can be obtained from the Secretary of the CP/M UG (UK). Groups that have been formed or are in the process of being formed are listed below.

Chiltern Branch (meets Welwyn Garden City), c/o Ed Brown, BEL, 12 The Chase, Marlow, Bucks SL7 1UU

Oxford Branch, c/o Mrs Joyce Clarke, Epsilon Consultancy Ltd, Waylands Croft, Stonefield, Oxford

High Wycombe Branch (being formed), c/o Neil Allen, Fidget Computerware, 150 Desborough Road, High Wycombe, Bucks HP11 2QA

Write your own Basic programs

THE Professional Basic supplied with the Z80 second processor is a run-only version provided primarily for running the *Accountant* and *Nucleus* packages from Compact Software. This means there are no interactive facilities for entering programs and for debugging. If you want to write your own programs in Professional Basic you must use *MemoPlan* in the line mode to create the source file (eg, PROG.BAS) and then run this through the Basic (eg, MALLARD PROG.BAS). Any errors then have to be corrected using *MemoPlan* and the program re-run. This is a fairly standard procedure for high level languages but not for Basic which is usually an interpreted language entered in a direct mode. A full version of Professional Basic can be obtained from Locomotive Software, 1 South Street, Dorking, Surrey.

The vampire strikes back

THE following was sent in by Michael Leete of Stockport and brought a smile to my face.

PRINTER SEARCH

Notes for typing program–
Don't bother!

```
REM Printer Search
REM by Michael Leete
REM On entry: X = byte this one
              Y = file in hand
              A = display of byte
              (in Vampire-Smile)
OPT This shop
INPUT
   "I am looking for a Printer for use
   with a Torch Z80 Disc Pack and the
   Perfect Software that comes with it."
PROCpatter
   . . . This model is strongly recom-
   mended . . . state of the art . . . Near
   Letter Quality and draft . . . user de-
   fined character set . . .
NMI How would I call up a user defined
character?
CLI
PROCsell
   . . . many optional extra fonts . . . mini-
   mal extra cost . . . special conference
   with our Technical Director. . . .
NMI How much is the printer as it stands?
SEI
ADC £ Garbage MOD Vampire-Smile
CLI
PROCsell
   . . . sold 40 to the Coal Board only last
   week . . .
NMI Yes, but how much is it?
CLI . . . special offer this week . . .
SED . . . just over 1700 pounds . . .
NMI gulp
RTI
PROCbrazen
   . . . plus VAT of course . . . nominal
   charges for . . . leads, delivery, instal-
   lation, testing, drinking your coffee,
   service . . .
IRQ Do you have a glass of water?
NEXT pass out
REM On exit VIA door with DCD in dis-
order and buzzing in the ears: X, Y
Registers undefined. Cash register
preserved.
```

Ready-to-run

BEL can now supply most CP/M packages for the Acorn Z80 second processor in a ready-to-run format thereby removing the problems encountered in installing the package to use the facilities of the BBC micro. Contact BEL, 12 The Chase, Marlow, Bucks SL7 1UU

Nuclear reaction

WITH the Acorn-supplied version of *Nucleus*, systems that are created cannot be altered by *Nucleus*. This means that if you make a mistake in generating your files or programs you have to start again from the beginning. An upgraded version of *Nucleus* is available from Compact Software, 1 Paper Mews, 330 High Street, Dorking, Surrey. However, it is possible to modify programs created by *Nucleus* as long as they are changed from their coded form into ASCII files. The only drawback here is that there is a distinct lack of space in the resulting ASCII file. To change a *Nucleus* program called PROG to an ASCII representation you need to do the following:

1. Use *MemoPlan* in line mode to create a file called BAS2ASC.BAS which con-

tains the instructions:

```
1 CHAIN MERGE "PROG", 65533
65533 SAVE "PROG1.BAS",A
65534 SYSTEM
```

2. Exit from *MemoPlan* and then run the program BAS2ASC through Professional Basic.
3. You now have a file called PROG 1.BAS (that is an ASCII form of PROG.BAS) which you can edit with *MemoPlan*.
4. When you have finished testing it, remember to rename the program back to the name given when it was created by *Nucleus*.

Restoration comedy

RESTORE with a computed value does not work correctly. This can be cured by removing the computation from the RESTORE instruction as in the example below:

```
M% = M%*50 + 10000: RESTORE M%
```

instead of

```
RESTORE M%*50 + 10000
```

The forthcoming release of updated CP/M software from Acorn should solve these problems.

Faulty functions

D W HARRIS of Wrexham has informed me of bugs in the ACS and ASN functions in version 2.20 of BBC Basic on the Z80 second processor. Both these functions return incorrect results when called with negative parameters. For example, ACS (−1.0) gives the result 0 when it should return PI (3.14159 etc). This can be cured by adding PI to the result if the original parameter is a negative value.

Tracking down suspicious characters

IT APPEARS that there is a fault on a small number of BBC micros with Z80 second processors. The fault shows itself as spurious characters on the screen when the Z80 is plugged in. To test your machine, turn on the Z80 second processor and BBC micro and boot up CP/M. Type DIR followed by a return and leave the machine for a while without touching the keyboard. Examine the display and check that the directory information is in columns and there are no spurious characters on the screen. If there are, take your BBC and Z80 second processor to your dealer who will be able to repair it. The same fault can also give garbage on the screen or printer in such a form that the machine is unusable – this occurred on mine and was solved by my dealer very quickly and at no cost.

MBASIC games turn Professional

WHEN I wrote the article on games for the September issue I mentioned that many of the MBASIC games wouldn't run under the Professional Basic supplied with the Beeb. This was a mystery to me as all the other MBASIC programs that I had would run perfectly. However, when the article appeared I was contacted by Locomotive and all was explained. The programs supplied with the Free Software Handbook are all supplied in MBASIC internal format and not in ASCII format. The internal format of Professional Basic is different from that of MBASIC and it can therefore only cope with MBASIC files that have been saved with the A option to make them ASCII.

New versions of the MBASIC programs are now available which will run under the Professional Basic supplied with the Z80 second processor. For further details contact Davis Rubin Associates, 1 Canonbourne, Western-sub-Edge, Chipping Campden, Glos GL55 6QH. Tel: (0386) 841181.

CP/M for beginners

'Introducing CP/M on the BBC micro Z80 second processor' by Bruce Smith, Collins £9.95

THIS book contains 13 chapters, three appendices and an index in its 171 pages. It moves from a simple introduction (where the author gets the acronym for CP/M wrong) through to a chapter entitled 'In Use' which explains such things as how to return the screen to normal once you have started it flashing from the CCP level.

Only one of the three appendices is really of any use – the other two are taken up with bar code listings and listings of the discs supplied with the Z80 second processor.

The bar code listings cannot be read into the Z80 and instructions are provided to transfer the programs from the bare BBC micro on to the Z80 second processor. Two useful programs are provided to allow creation of a BOOT. COM program for auto-booting and for reading CPN files from a Torch system.

The auto-boot program can be modified to run any of the programs supplied with the Z80 second processor. It is written to use a program called Wordstar, though, which isn't supplied. It would have been much more useful if the author had done this and provided the program in a form that used *MemoPlan* as most of the potential



audience will find this exercise totally beyond them.

The book explains most of the standard CP/M commands in reasonable detail but with three notable exceptions. The assembler and debugger (ASM and DDT) are skipped over in about eight pages and the editor (ED) takes up a massive 40 pages and *MemoPlan* is not covered at all. In fact, apart from a few brief mentions, the bundled software is omitted from the book altogether.

The book is a useful introduction to CP/M for the complete novice but it does not quite live up to cover blurb describing it.

Hopefully Collins will follow this book with a similar guide for the bundled software and a more advanced guide to CP/M. Books are sorely needed for the Z80 second processor and I hope to see more of them in the near future.

If you're a CP/M user with problems, or have hints you'd like to pass on, then write to CP/M Corner, Acorn User, Redwood Publishing, 68 Long Acre, London WC2E 9JH. If you want advice, please supply as much information as possible, enclose a stamped addressed envelope if you'd like a reply, and give your 'phone number if you don't mind us telephoning you.

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AU/02

Club 403 hits Birmingham

IF YOU are in the Birmingham area, a local Prestel service may have grabbed your attention. Called Club 403, it provides a teleshopping, news, information and leisure service as well as an education section. This offers information on schools, further education and careers as well as local evening classes, educational games, supplies, news about schools and their projects and a wealth of other information not available on the normal Prestel service.

Page 403 is, of course, their location and joining this Closed User Group (CUG) is free. The children's fun pages, incidentally, have some quite taxing logic puzzles on them, so beware!

Schoolfax local viewdata system is upgraded



SCHOOLFAX, which seems to have been mentioned a lot in these pages recently, has produced some changes to its local viewdata system. There is now an E-Net version available on double sided 40-track disc.

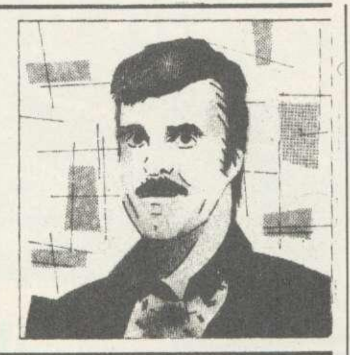
Some minor changes have been made to the Editor program and several new commands and facilities have been added in response to comments from the public, reviewers and teachers.

The manual comes as a text file on the disc and as a printed appendix to the existing manual.

Non-protected versions of the new upgrade are available to existing users for £5 or on receipt of two blank discs (the new version covers two discs). New users will receive the whole package at the existing price of £30.

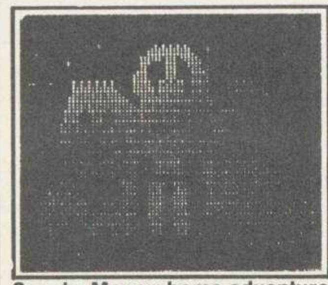
Further information from Schoolfax, 24 Somerset Road, Swindon SN2 1NF. Tel: (0793) 695296.

Commentary by Nick Evans, who welcomes reader feedback



Acornsoft's new home software

ACORNSOFT has brought out some interesting products under its Home Education banner which may have uses in school as well. The *Spooky Manor* adventure game is unusual in that four players can play and communicate with each other within the same 'building'. So, for example, Craig finds himself in the Banqueting Hall and discovers a silver key which he knows is wanted by Tessie. So he types in 'Call Tessie'. On Tessie's portion of the screen comes the message 'Craig wants you'. All the commands are standard in adventure gaming but the environment is smaller than normal. It is designed to encourage logical thinking and planning, while being enjoyable.



Spooky Manor: home adventure

Another of these new programs is *Talkback* – a version of the original *Eliza* program in which users held 'conversations' with the computer by typing in sentences. The program responded by displaying sentences that were (apparently) logical replies. The original idea has been modified so that the user can create his/her own characters, capable of holding simple conversations on the screen. The program



Talk back: on-screen chats

operates by associating a response with a keyword. The creation of the character is dependent on the user being able to create an appropriate file of responses but, more importantly, on being able to anticipate the context in which they may be needed.

The whole idea throws up many ideas in terms of the use of language, its context and structure and, with careful use, it could be tailored to a great many purposes in English lessons.

Another text-based program is *ABC*, a simple wordprocessor, which has facilities that grow with the user. Simple input of text is achieved in the 'write' option and the user may then centre lines, delete and insert very easily using the function keys which are labelled with symbols. 'Paint', for example, paints a word, line or paragraph in a different colour to enable that section to be deleted or moved around. There is also a 'read and write' section in which the user may view what has already been written while at the same time adding to it. The 'slate' facility provides a scratch pad for notes which will not affect the main text.

College tracks satellite with a BBC micro

CLIFTON College in Bristol has been undertaking project work involving the tracking and decoding of satellite signals since January '85 and is now able to display pictures from satellites such as Meteosat II, Uosat I and II and NOAA 6 and 9 on a BBC B. The Beeb can be used to control the antenna movement for tracking polar orbiting satellites; to generate software to predict the orbits of the satellites and to decode and display weather pictures. The obvious use for this sort of material is in Geography and Science departments and Clifton College hopes to offer free access to the data by using a modem.

For around £5 the school will provide the software to generate weather pictures, and for about £60 you can have the electronics for interfacing the Beeb to decode live data. A few hundred pounds will buy the modem and necessary bits and pieces to receive data from the school and a few thousand will buy the equipment to decode your own picture live from Meteosat II. More work is being undertaken in receiving foreign language television stations, which may be of interest to Modern Languages departments.

Details and prices of all these projects may be had from C D Gardiner, Clifton College, Bristol BS8 3JH.

Sheffield adopts 50p network idea

SHEFFIELD Education Department has taken up ideas from *Acorn User* on the *The 50p Network* (June 1983) and developed them in a variety of schools. The article was distributed to schools and they are now reaping the benefits of networking at a very low cost. If your school has used any of our projects to good educational ends and feels that it would like to communicate the development, implementation and improvements on the idea, please write to the Education Column.

Get dressed by micro

A SET of programs from the Gifted Children's Information Centre aims to help primary school-age and older children with special needs.

The programs cover the following topics: *Early Skills* – for children experiencing learning difficulties in reading, spelling and writing. It ranges from the matching of upper- and lower-case letters and correct letter formation to the recall of difficult words. Other programs involve words with similar sounds, number words, plurals, alphabetic order and past tense.

Developing Skills – suitable for both primary and secondary children, these programs cover spatial relationships, line drawings and an understanding of direction; practice in spelling difficult letter-structures; an understanding of the different parts of speech, punctuation, estimation; using timetables and fractions.

Basic Number and Language Skills – covers early number bonds, coin values, shape and letter recognition and alphabetic order. There is also a program on getting dressed.

Simple Use of Language – looks at familiar household words as well as positional words, comparative speeds and directions.

Finally, *Number, Shape and Word Wise* – covers shape matching, seriation and one-to-one correspondence, simple addition, number matching, letter recognition, plurals and line drawing.

These programs can be ordered at £6.90 a disc from the Gifted Children's Information Centre, Hampton Grange, 21 Hampton Lane, Solihull B91 2QJ. Tel: 021-705 4547.

New recruits sought for help scheme

FURTHER to the item in the January 1985 issue about the CCC-MSC Microprogrammers in School Scheme in Warrington, Peter Booth – the manager of the scheme – has written to say that it has been further extended.

New recruits are now being sought as programmers to help teachers with the use of micros in the Warrington area. The jobs form part of the community program and applicants between 18 and 24 must have been out of work for at least six of the last nine months. Those over 25 should have been unemployed for 12 of the last 15 months. Salary is £59.85 for a 26-hour week. Contact Jane Amos on (0244) 312606.

How about more LEAs doing something similar?

Bibliography's low-cost licence

MAGAZINE BIBLIOGRAPHY
This program offers 3 choices-
(1) View the whole bibliography.
(2) View one specific section.
(3) One or two-string searches of the whole bibliography.
Press the number of your choice

Bibliography: a good offer to LEAs

THE producers of the Magazine Bibliography I raved about a few months ago, McHugh Enterprises, have managed to strike me speechless with their latest offer to LEAs. This is a licensing arrangement for the entire Bibliography at only £200 per authority per year. For this, the LEA will be able to distribute to every school a 775k database of references about the BBC micro and associated peripherals and projects. Further details may be had from 43 Hookstone Oval, Harrogate, N Yorks HG2 8QE.

New venture into teaching French

MODERN Linguists! Are you tired of the same old software? The answer is probably yes – and even if it isn't, you'll be interested in a French adventure game which really does seem to work.

There have been several ventures into this field, usually involving translations of existing games – which causes them to miss the purpose and point of such a program in the classroom entirely. Silversoft, which produces *French on the Run!*, started from exactly the right premise. It has asked itself who its target audience is, what level of language is required and what the teaching points linked with each item should deal with.

The first thing to point out is that the entire text isn't in French. The reason for this is the scenario. The user is an English pilot stranded in occupied France during the Second World War. His mission is to get a secret message to a remote part of France, taking his chances with the occupying forces and relying on his skill in the language. When I discovered that this was a multi-choice exercise I wasn't too sure about it – until I played it! One of your companions is a traitor and will be recognisable by his or her poor French. Your responses to the questions you're asked and the things you have to say in order to find your way and survive all determine whether or not you are captured. A simple example is where the pronoun in your answer has to be in the correct place and in the correct form. Your four alternatives all look right – but only one is the correct idiom.

The four adventures (each dependent on the previous one) lead you through ever more difficult linguistic territory – as well as through some



Demanding and stimulating

fairly hairy encounters with the opposition. After you have fallen into one of the many traps set for you, you're able to look back at the alternatives to discover where you went wrong.

The program is aimed at pre O-level pupils, around fourth and fifth year.

Silversoft, Unit 7D, Kings Yard, Carpenters Road, London E15 2HD. Tel: 01-985 5614.

Education Top Ten

Title	Publisher	Cassette	Disc	ROM	Electron	Shadow on B+	6502	Econet
1 (4) Music System	Island Logic	—	£29.95	—	—	Yes	—	—
2 (3) German Master A and B	Kosmos	£8.95	£9.95	—	Yes	Yes	—	Yes
3 (5) Podd	ASK	£9.95	£11.50	—	Yes	Yes	—	—
4 (6) Mr T (series)	Ebury	£9.95	—	—	Yes	Yes	—	—
5 (1) French Mistress A and B	Kosmos	£8.95	£9.95	—	Yes	Yes	—	Yes
6 (7) Mr Men (series)	Mirrorsoft	£8.95	£11.95	—	Yes	Yes	—	—
7 (2) Pan 'O' Level (series)	Hill McGibbon	£14.95	£19.95	—	Yes	Yes	—	—
8 (8) Spanish Tutor A and B	Kosmos	£8.95	£9.95	—	Yes	Yes	—	Yes
9 (10) Read Write Away (series)	Highlight	£7.95	£11.95	—	Yes	Yes	—	—
10 (9) Best Four – Maths	ASK	£19.95	£19.95	—	Yes	Yes	—	—

Compiled by RAM/Computer from a panel of specialist dealers

Contact publishers: Kosmos Software, 1 Pilgrims Close, Harlington, Dunstable, Beds; Hill McGibbon, St Bartholomew House, 92 Fleet Street, London EC4; Island Logic System, 12 Collegiate Crescent, Sheffield S10 2BA; ASK, London House, 68 Upper Richmond Road, London SW15 01-874 6046; Ebury Software, National Magazine Co, 72 Broadwick Street, London W1; Mirrorsoft, Mirror Group Newspapers, Holborn Circus, London EC1P 0DQ 01-353 0246; Highlight Software, 36 Sherbourne Close, Barry, South Glamorgan CF6 5AQ (0446) 745482

CLASSROOM CREATIVITY

What do children like in graphics packages used in schools? Chris Drage and Nick Evans report

THIS month the education column looks at graphics in the classroom and examines not only the input devices and the software available but also classroom practice – so that you can get the best from your Beeb with the children.

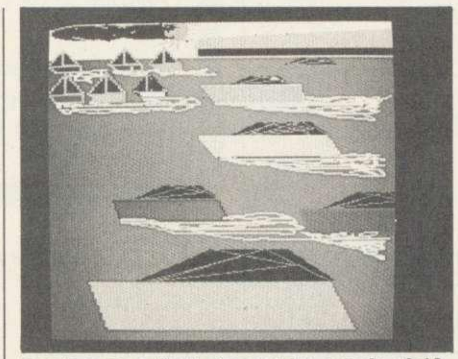
I was very tempted to approach the graphics theme from a Logo point of view. However, most graphics work my 10-year-olds have experienced this year has been through commercial graphics/design-type packages using a variety of input devices. The children really do see computer art as 'picture processing', which has been a natural progression from using the machine to write with wordprocessing. As children have been able to manipulate text so they have been able to manipulate images. This approach has provided certain individuals freedom from the constraints of traditional classroom materials and modes of working, to explore new horizons.

The light pen is a natural input device for young children for whom crayons, pencils and paint brushes are all too familiar. It is usually considered to be an inaccurate device which loses pixel accuracy, but this is not the case. By choosing a quality light pen (like the Robin Educational) and the right software, pixel accuracy is indeed possible.

Design & Graphics

The light pen software chosen was the Robin *Design & Graphics*. This was deliberate as all the children were familiar with *Paintbrush* and *Super Paint & Draw* programs used in the past and *Design & Graphics* follows these packages naturally. I would advise anyone exploring light pen graphics with children to use *Paintbrush*.

Design & Graphics contains all the usual facilities to draw, colour and colour-fill. Where it scores over similar packages is in its design mode. This enables a design of up to 50 joined points to be created (and edited), and then moved to the required position on the screen. The design may then be shrunk or enlarged and fixed. The process may be repeated any number of times with the same design. This zooming effect is what really enthused the children. Unable to repeat objects over the screen in the past, they now had the tool to produce multiple images relatively easily. Each new design may be saved and then called back later to be used in future screens.



Boats was a first attempt by a pair of 10-year-olds using *Computer Art*

A number of useful geometric shapes are available via the function keys, including ellipse and arc. Again, once a shape is defined in *Design & Graphics* it may be moved around the screen and zoomed repeatedly. Eight colours are available from the palette for drawing and filling. Unfortunately, no painting (or spray) mode is available – this would allow erasing of mistakes. *Design & Graphics* is not really compatible with *Paintbrush* or *Super Paint & Draw*. It does, however, interface perfectly with *Penpal* (*Acorn User* Jan '85 p183), which is not entirely unexpected, as they are written by the same author.

The main difficulties encountered with *Design & Graphics* concern learning the procedures for each operation. Once familiar with 'how to do it', some really interesting picture-processing is possible.

Computer Art

The choice of the Concept Keyboard is a matter of practicality rather than design. As many schools have purchased a Concept Keyboard, it makes sense to use this versatile device in as many varied roles as possible. *Computer Art* from Star Devices converts the keypad into a useful graphic tool, unlikely though it may first appear.

Central to the program is an infinitely adjustable screen window. The overlay forms a window of 8 × 8 cells; when one is pressed a corresponding cell of the current window on the screen is filled in with the colour selected from the colour columns on the overlay. The full set of mode 2 colours are available. By pressing the appropriate overlay keys the screen window can be moved and altered in size. The contents can be copied to another part of the screen, or saved onto disc. A number of predefined shapes are also provided, their size being determined by the current window size. Similarly, variable-sized text may be entered. Fills are limited to the rectangle of the current window.

A few children felt negative towards the program at first – they thought themselves to be 'superior light pen pushers'. However, those who decided that this was worth a try were not disappointed. In fact, two children persevered through a week of playtimes to get their 'Grand Prix' picture just right. They made extensive use of the copy window facility to create the crowd of spectators. There are several shortcomings to the program, though. The children felt that some zooming should be possible (they've now been spoilt, you see) and that rubber-banding should be included to aid line drawing.

They also felt that picture processing with *Computer Art* was a rather long-winded process. Star Devices inform me that these shortcomings have already been dealt with in *Computer Art II*, soon to be released.

Paintbox II

Several suitable joystick-based graphics packages for children do exist; Beebugsoft's *Paintbox II* being one. The joystick is probably the most popular and cheapest input device. When used with a general-purpose design program like *Paintbox II* it provides a much easier tool to use than the computer's keyboard.

Despite its sophistication, *Paintbox II*'s main strength lies in its ease of use. In this respect it compares very favourably with Robin *Design & Graphics*. It certainly combines a wide range of facilities, easily accessible from two toggled menus. Eight colours are available and there are eight different brush widths. Partial fills are possible as is automatic shading of any area, in a combination of any two colours. In addition, horizontal and vertical stripes may be drawn automatically. *Paintbox II* provides enormous scope for budding computer artists.

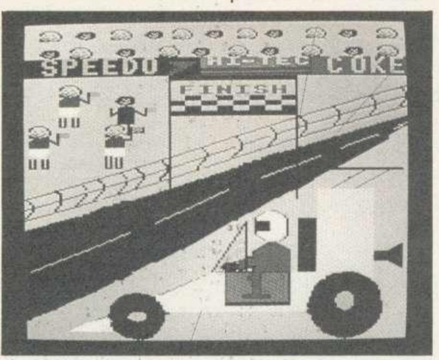
A good-quality analogue joystick like the Voltmace Delta 14 is essential if any degree of accuracy is to be achieved. Even so, this means of input requires a fair degree of fine motor control, which many children find difficult to achieve without lots of practice. Because of this I haven't used a joystick much with 10-year-olds.

Mice

The AMX Mouse fares much better in this respect, as gross hand movement is far easier for children. The various fill patterns are instantly popular and the friendly little rodent allows some sophisticated picture-processing.

The major factor in favour of the mouse as an input device is its ease of use. Once co-ordination has been established between hand and eye there is no stopping an enthusiast from discovering the full potential of this very powerful graphics aid.

It should be pointed out here that there are two main contenders for classroom use in the mouse field – first, the AMX version which is very well-known since it has been reviewed in many magazines and because of its high-profile advertising. Second, there is the Wigmore Megamouse, sometimes called the 'whispering mouse'. This company has a low-profile approach to marketing but is nonetheless providing a product of excellent quality. Their two main advantages are that they use a rubber ball inside the mouse, which will not slip on smooth surfaces and, they proudly say, the product is British. It might be thought that these two firms are in competition and I suppose to a certain extent they are. Yet their products are not. Outwardly similar in many respects and definitely of equal utility, the two packages serve different areas of the market. The AMX Mouse *Art* program is definitely what its title suggests – it is for designing and creating free-form pictures and its facilities have been designed for that purpose. With its AMX *Paint* disc it is now possible to colour pictures created with the *Art* program and there is a slide utility allowing a cycling series of pictures to be set up. Watford Electronics also provide a colouring program for AMX pictures. Called *Colour Art*, it provides a greater range of colours than the AMX version but does not have the slide facility.



Grand Prix took a week of playtimes to get just right with *Design & Graphics*



Paintbox II provides enormous scope for budding computer artists

ADDRESSES

Robin Design & Graphics, BBC B, £36 (including the Robin Educational Light Pen).
The Educational Software Co Ltd, 108 Parthenon Drive, Liverpool L11 7AQ. Tel: 051-226 1214

Computer Art, BBC B, incuded in Flying Start software supplied free with each Concept Keyboard.
Star Devices Ltd, 22 Hyde Street, Winchester, Hampshire SO23 7DR. Tel: (0962) 63626

Paintbox II, BBC B/Electron, £10 cassette, £12 disc.
Beebugsoft, PO Box 109, High Wycombe, Buckinghamshire HP11 2TD. Tel: (0727) 60263

The Wigmore Megamouse has a very different function. Although free-form art work is possible, and in colour as well, the true potential of the software is seen in design work. In a CDT environment (Craft, Design and Technology) the Megamouse would make an excellent technical drawing tool – it has facilities for moving areas of the picture, rotating, part-loading into areas of the screen, labelling and dimensioning with text written in several directions. Moreover, BS308 centre lines are available and lines can be connected, allowing accurate projections to be drawn.

The problem of integrating either of these packages into the primary or secondary classroom is that they are only available in one machine at a time since the mouse is a necessary peripheral. This is doubly the case with the AMX Mouse as it also has a ROM resident in the micro – so only one pupil at a time can have access to it.

Having said that, though, the advantages are enormous. Children are released from the failure syndrome by the 'picture processing' facility in much the same way that a wordprocessor can release poor writers. The beauty of both packages is that the ease of use of the mouse on menus and icons has proved to be a massive step forward in making the computer friendly to use.

With mice (and any graphics package you attempt to use with children), try to divide their experience into three parts: first, demonstrate how certain essential things are achieved with the hardware and software provided. Be careful, though, to leave some aspects open for discovery – 'give them a taste' sums up this stage; second, allow children time to play and experiment with the facilities on offer. When they have 'discovered' an interesting technique they will quite often be motivated to attempt an ambitious picture or design. Third, give them time to develop and amend their 'work of art'. This is heavy on computer-time but can be achieved at lunch-times, or in sessions before school. This time is amply rewarded by the tremendous pride and satisfaction gained.

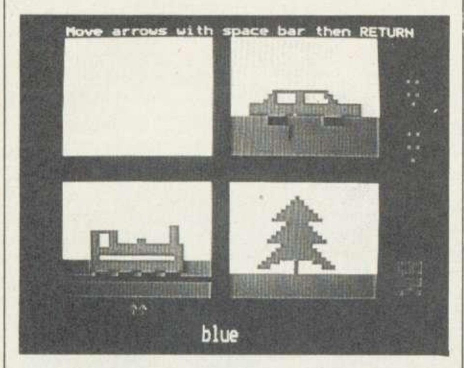
A well-executed screen can finally be dumped to the printer so that each child has a hard copy to take home and the teacher can add a new picture to the ever-growing wall chart entitled: 'Our Computer Art Work'.

Picture puzzles

'Words and Pictures', Chalksoft, PO Box 49, Spalding, Lincs PE11 1NZ. Tel: 0775 69518, £9.95, disc £12.95

WORDS and Pictures is a suite of educational programs written for three- to seven-year-olds. They aim to teach a selection of words and sentences using pictures drawn in mode 7 graphics. There is a six-page booklet containing useful notes for parents, and a complete list of all the words covered by the package.

The package contains five programs, all written in Basic. The first side of the cassette contains WORDSA and



SENTSA, with an introductory program allowing selection from a menu. The reverse has the same menu plus WORDSB and SENTSB. In each case the second program produces a sentence using the words from the first.

The initial part of the suite is obviously designed to be used by parent or teacher. After selecting one of the programs, you are given the chance to change the sound level. This is very welcome because, although the tune used is good, it becomes very wearing.

Next you are asked if scores are wanted. Answering YES produces a request for the first child's name, and then others in turn. If this option is chosen, the computer displays a score after each turn and says who is next.

From now on the children are on their own. Each child has ten screens, with four pictures on each. There is a word or sentence at the bottom of the screen and the child moves arrows from one picture to the next by pressing the space bar. When he/she is happy that the picture corresponds with the word or sentence given, Return is pressed. If the answer is correct, the little green frog on the right of the screen eats another of the ten bugs buzzing around his head.

After the ten screens, there is a song with five frogs jumping into a pool one after another. The tune is catchy and the words are displayed on the screen to encourage singing and, with any luck, reading.

This is an attempt at writing software in a field in which it is notoriously difficult to succeed, and I look forward to seeing more. **Frank Jones**

Plane sailing

'Flight Path', Storm Software, Newbury Court, High Street, Gillingham, Dorset SP8 4QX. Tel: (07476) 2774, £20.30 (disc only)

REALLY good and accurate simulations are becoming a real part of the educational scene as programmers start to get to grips with what educationalists require and the educationalists begin to realise what the computer can do. This package, a simulation of an airline flight within Europe, is the result of such thought and liaison.

The idea of the package is that it should be integrated into topic work dealing with, say, travel, geography,



economics of flight, or even maths! All these facets are present and probably a good deal more as well.The package doesn't depend upon the computer program: a much wider vista is laid out with suggestions for development, work sheets and reference charts.

The player – who is the owner of the airline – aims to take the plane from one airport on the map to another via up to two intermediary stops. During the entire exercise, which starts with booking and choosing the plane and ends with accounts, the player must deal with all the problems and calculations that would be necessary in real life: fuel and distance, passenger numbers and plane availability, weather and navigation – a real stinker this, because you have to understand the corrections in bearing for differing wind speeds/directions. However, if you get stuck the computer will give you a lesson – very clearly and thoroughly.

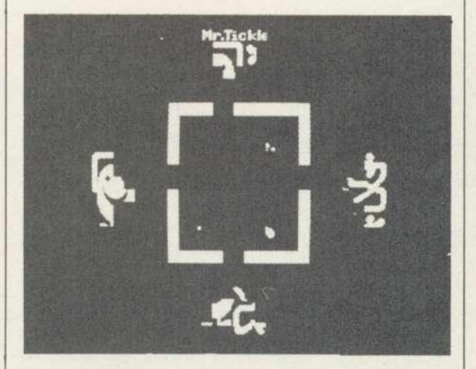
To do this program proper justice, it would need a good deal more description than I have room for. £20+ may seem expensive for a program, but you really get value for money as it's an excellent addition to any school's software selection. **Nick Evans**

Turn left, all right?

'Here and There with the Mr Men', Mirrorsoft, Holborn Circus, London EC1P 1DQ. £7.95 (cassette), £10.95 (disc)

THE concept of left and right, and especially other people's left and right, is confusing to a good many adults – never mind children! So any program which seeks to establish that skill can only be termed 'useful'. *Here and There* is in fact a suite of four well-designed, well thought-out, robust programs.

The first is *Mr Tickle's Jigsaw Puzzle*. The child has to manipulate doorways in the square frame of the puzzle to allow the 'pieces' which have been highlighted to pass through them. Movement of each of the four doorways is achieved by using the cursor control keys. The children quickly learn that



the left/right orientation is very different from the up/down one.

The second puzzle, *Mr Tickle and Mr Grumpy*, involves the child in a similar task except that the job is now to make Mr Tickle (on the outside of the frame) tickle Mr Grumpy (on the inside of the frame). The doorways may be moved and the child must input instructions – more difficult this – so that Mr Tickle's arm may travel from where he is, through the doorway, and finally to Mr Grumpy. The child may still use the cursor keys or L,R,U and D. Quite a lot of directional skill is needed for this one, and some helpful examples are given in the accompanying booklet.

Mr Lazy is a fun program in which the child must direct the worm up the tree so that it dislodges the apple and drops it into Mr Lazy's waiting mouth.

And finally comes *Mr Men versus Mr Tickle* in which the child must guide the Mr Men to stop Mr Tickle crossing the chequer-board. Here, the concept of the left and right of people facing you is explored.

Altogether; excellent value, good fun and well-liked by those who tried it out.

Nick Evans

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In addition to working with the standard single density DFS's REPLICA II is now compatible with the following double density DFS: OPUS 3.45, UDM v. 2.00 and CUMANA QFS.

The original REPLICA set a very high standard so the specification that we set our chief programmer presented him with a real challenge. In fact REPLICA II is now 2 separate programs, one for DFS using the 8271 controller and the other for the various DDFS that fully implement OSWORD &7F. REPLICA II will transfer many of your cassette based programs to disc, even more than REPLICA did. Now when you buy disc drives you do not have to throw away your expensive cassette based programs.

REPLICA II transfers 'LOCKED' programs, programs loading as files, programs that load below &EOO, those with up to 9 sections and those up to &6E in length e.g. adventure programs. No more waiting for 6 minutes whilst your adventure programs load.

REPLICA II is very easy to use and the user just enters a name, how many sections and whether CHAIN, *RUN or *LOAD is used to load the first section. Press play and let the program do the rest, even a menu. Just think how much it will cost you to buy a disc version of your favourite program—it is probably more than REPLICA II, which will hold up to 16 programs, limited only by the disc capacity and catalogue.

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This is the first module in an integrated accounting suite of programs written to be used and not simply to please an accountant. This module contains an INVOICE and DELIVERY NOTE program with 80 column input and screen editing, you see what will be printed before committing yourself. Account customer details are inserted automatically and delivery notes generated automatically when required. Customer details without account numbers can be automatically placed in a Beta-Base compatible file for use as a mailing list.

A sales ledger sheet is printed automatically when there is enough data to fill a page, alternatively the user can print the ledger sheet before a full page to suit his needs. VAT details are generated at the end of the VAT period and the year to date figures can be viewed at any time. Provision is made for multiple VAT rates including standard, zero, export and exempt.

A transaction file is generated for account customers for use with the STATEMENTS and ACCOUNTS RECEIVABLE module.

Future modules will be STATEMENT and ACCOUNTS RECEIVABLE, STOCK CONTROL, ACCOUNTS PAYABLE and NOMINAL LEDGER. All relative files are compatible with CLARES Beta-Base which can be used to manipulate the files as required. A Beta-Base Utilities Disc will soon be available and will provide Mail-Merge facilities and links into ULTRACALC plus many other features.

★ INTEGRATED ACCOUNTS and DATABASE
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★ ACCOUNT HOLDERS details inserted automatically
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★ LEDGER SHEET printed automatically
★ VAT sales returns prepared
★ TRANSACTION FILE generated
★ Beta-Base compatible

This program was written for our own use and is used to prepare hundreds of invoices per week. It has no unnecessary questions or keys to press and extensive but easy edit options, we have made life as easy as possible for ourselves so why not take advantage of our efforts.

Requires double sided single or twin single sided drives for minimum configuration –no stock control or customer database. Double sided twin drives will enable a full integrated system to be used.

FUN HOUSE £10.00



FUN HOUSE is a highly original suite of educational programs suitable for ages 3 to 13. The program is designed to encourage children to spell words which relate to objects found around the home. Animation and music are used to good effect and some highly original ideas are incorporated. Each room exercise is terminated with a warning item e.g. the lounge finishes with 'FIRE' which goes on to engulf the whole lounge. Tests with a newly hired 4 year old resulted in us having to prise him away from the keyboard after 2 hours. In that time he had gone from never having used a keyboard to finding the location of all the keys very quickly and entering the correct answer. He had thus started on the path to learning spelling and familiarised himself with the keyboard including the use of DELETE to correct his mistakes. Can you afford not to give your children the same start?



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BROM

21 EXTRA COMMANDS

THE NUMBER ONE

TOOLKIT ROM
FROM CLARES

BROM  **£34.50**  **£27.50**

BROM is the first toolkit ROM to provide a FULL SCREEN EDITOR, which means that you can scroll your program up and down just like WORDWISE does with text, do not confuse this powerful editor with the line editor used in other toolkit ROMs. The EDITOR allows insertion and deletion of lines and insert and overwrite within a line. This is the editor that the BBC micro should have had.

Closely related to the EDITOR is the EXTENDED ERROR HANDLING which will trap errors in a program and enter the EDITOR at the line generating the error, not only that but it will also position the cursor as near to the statement causing the error as possible, no more wading through multi statement lines trying to identify the error.

Commands unique to BROM are:

ROMON & ROMOFF which enable you to turn on/off sideways ROMs so that they stay off even after CTRL/BREAK, very useful for avoiding clashes especially for users with second processors. This also works with the DFS and reverts to PAGE &EOO automatically.

CASE which forces input into upper or lower case irrespective of caps/shift lock.

FLIST which lists a program one statement to a line but more importantly it will even list 'BAD PROGRAMS.'

ONEKEY is a single key entry option but you can also define your own strings to any ASCII key, just like an extra 48 function keys.

Another group of commands provide FIND and selective or global SEARCH and REPLACE facilities. These commands work with strings and keywords or a mixture of both e.g. "*FIND PROChelp T', will list the full line containing PROChelp, the 'T' simply tokenizes any keywords.

Yet another group of commands allow lines to be moved or copied to a new location.

The other commands provide function key editor, 'BAD PROGRAM' cure, variable lister, integer variable flush, program compacter etc.

This is a genuinely useful ROM that no user should be without. Be warned, once used you will not be able to live without it!

"...this is the best On-Screen BASIC Editor I have ever used; it is far superior to BEEBUG softs Toolkit."
Viewfax Tubelink

The Brom disc is suitable for use with SOLIDISK SIDEWAYS RAM.

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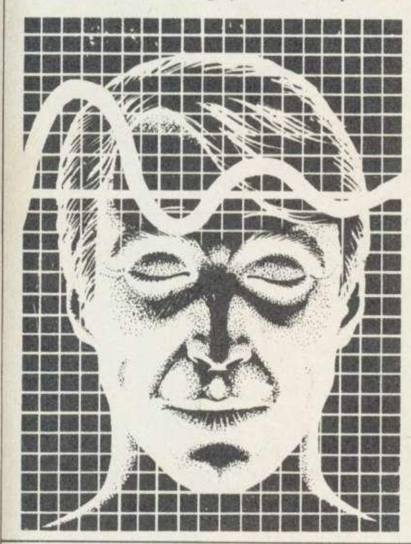
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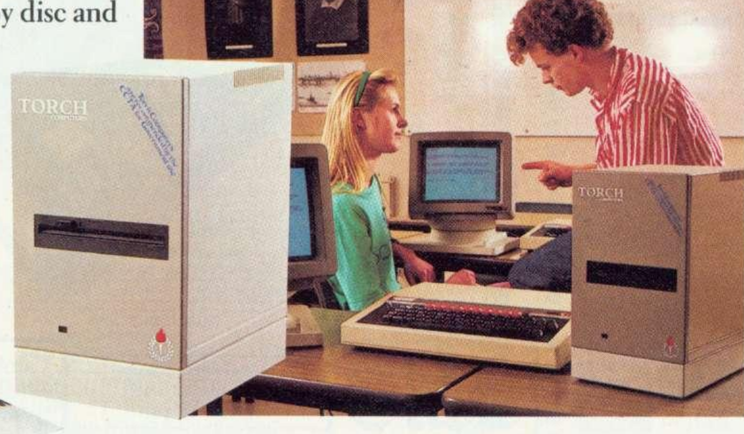
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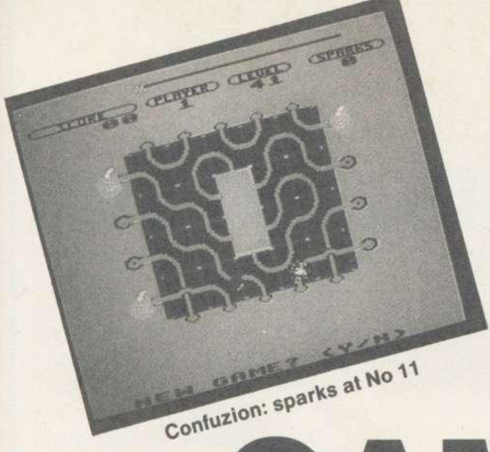
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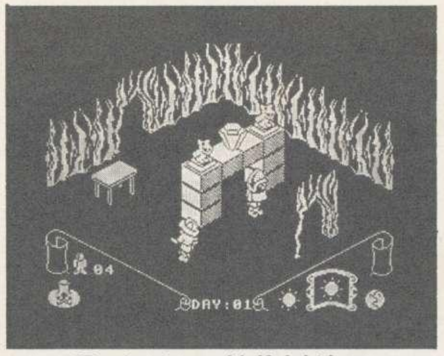


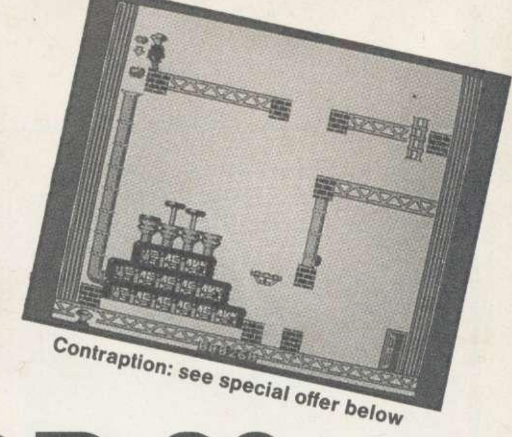


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3D adventure with Knight Lore

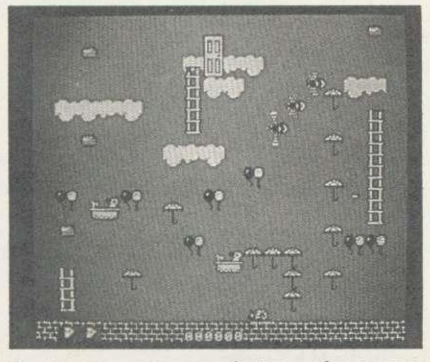

Contraption: see special offer below

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		TITLE	PUBLISHER	PRICE	MICRO	REVIEWED
1	(1)	Revs	Acornsoft	£14.95 (£17.95)	B	July '85
2	(2)	Alien 8	Ultimate	£9.95	B	
3	(-)	Beach-head	Access/US Gold	£9.95	B	
4	(6)	Elite	Acornsoft	£14.95 (£17.95)	B/E	October '84
5	(3)	Atic Atac	Ultimate	£7.95	B	
6	(-)	Red Moon	Level 9	£6.99	B/E	
7	(4)	Repton	Superior	£9.95 (£11.95)	B/E	September '85
8	(5)	Knight Lore	Ultimate	£9.95	B	November '85
9	(7)	Magic Mushrooms	Acornsoft	£12.95 (£14.95)	B/E	May '85
10	(-)	Contraption	Icon	£8.95	B	November '85
11	(9)	Confuzion	Incentive	£8.95	B/E	October '85
12	(11)	Combat Lynx	Durrell	£8.95	B/E	September '85
13	(8)	Wizardore	Imagine	£7.95	B	August '85
14	(10)	Lode Runner	Software Projects	£7.95	B	
15	(14)	Brian Jacks Superstar	Durrell	£7.95	B/E	August '85
16	(15)	Football Manager	Addictive	£7.95	B/E	March '85
17	(18)	Gremlins	Adventure International	£7.95	B/E	
18	(12)	Castle Quest	Micro Power	£12.95 (£14.95)	B	March '85
19	(13)	Manic Miner	Software Projects	£7.95	B	May '85
20	(17)	Pole Position	Atarisoft	£9.99	B	February '85

B = BBC. E = Electron. Prices in brackets are for disc versions. Compiled by RAM/Computer.

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Fickle fiancée

'Shanghai', Software Express, BBC B and Electron, £7.95

YOUR fiancée, kidnapped by slave traders, is being held prisoner on the top floor of a shanty in Shanghai. You are (guess where?) at the bottom of a shanty in Shanghai, and your task is to rescue her. Actually, it looks more like a high-tech warehouse than a shanty, with a very familiar set of girders and ladders between you and your beloved. There are also a few slow-moving nasties – pink ones and blue ones – strolling around, and a sword, a key and a stick of dynamite to help you on your way.

If you light the dynamite at a brazier and drop it anywhere, it will blast away anything that happens to be on that floor when the fuse burns down. Otherwise, it's the usual trek to the top, use the key to open the door, invite your betrothed to follow you downstairs to live happily ever after. The guardian who was looking after her, an ugly geezer with flashing eyes, will soon traipse after you but it's not too difficult to evade him.

Shanghai's graphics are predictable but pleasant enough and the animation



smooth but unexciting. The sound is feeble – just the odd bleep when you stumble into somebody or something and an irritating alarm clock when you run out of time.

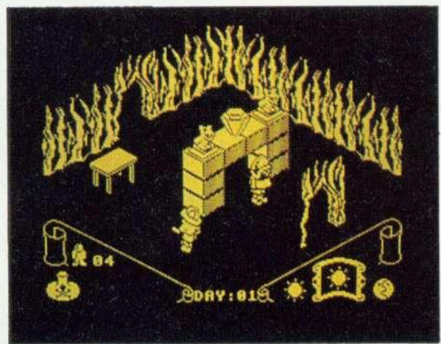
The most frustrating thing of all is the behaviour of your fiancée, a fearsome creature with red hair and a blue face. You'd think she'd be grateful for your heroic rescue and follow you diligently to safety. But if you go too far ahead, she loses interest and wanders round aimlessly, and if you happen to bump into her she destroys you. Makes you wonder why you bothered. **Jeffery Pike**

Lore unto itself

'Knight Lore', Ultimate, BBC B (1.2 OS), £9.95

SIMULATING three dimensions on a two-dimensional screen has been a challenge to software authors right from the start. *Knight Lore* reaches standards higher than any I have seen, with the possible exception of *Elite*, that is. The scene is set in castle 'Knight Lore'. Within its walls is a staggering array of guards, ghosts and gargoyles, many of them intelligent and often very mischievous. The object of your quest is to find the old Wizard, who, as you might expect, is a rather elusive character.

Adding the third dimension to a game brings about a whole set of new problems and challenges. First you must master the key controls but they are easy enough to get the hang of. Another problem comes when you try to judge distances. At first it is all too easy to walk into a set of spikes when you think your path is clear. Perhaps



the trickiest problem with a 3D scenario, however, is that your hero may be moving behind objects and therefore hidden. As you might guess, this can be hazardous in the extreme – there are lots of nasties lurking out of sight.

You're given just 40 days and nights to complete your task. As day turns to night your intrepid explorer turns into a werewolf. This means that some obstacles can only be overcome in the daytime and others only at night. I particularly like the change-over from man to beast – reminiscent of many early horror movies!

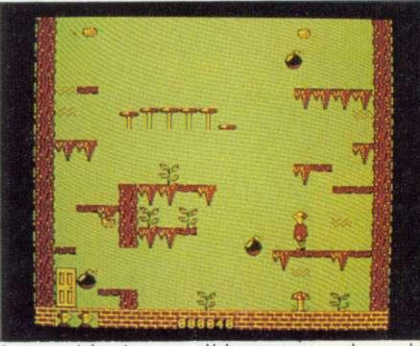
Knight Lore has to be the most challenging, inventive and addictive game of its class, although, that said, there cannot be many others in that class yet. 3D arcade adventures such as this are without doubt the games of the future and Ultimate have achieved a great deal in bringing us such a sophisticated game today. **David Acton**

High-speed heroics

'Contraption', Icon Software, BBC B, £8.95

THE platform games around at the moment can easily be divided into two groups – those which have carefully thought-out screens and characters, and those which have been thrown together to satisfy the addicts. *Contraption* makes it into the first group without any effort.

Mode 1 graphics have been opted for, giving more clearly-defined characters than you are likely to see elsewhere. The whole screen is used

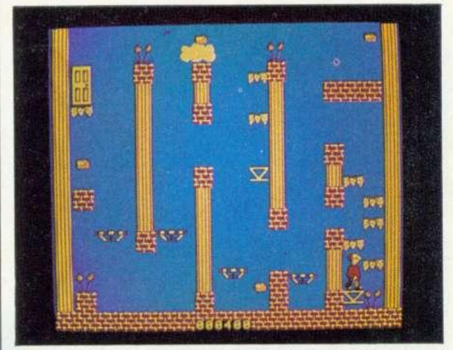


too, not just a small box somewhere in the middle of a black void. So many games squash the display down to gain vital bytes that to see a full-sized screen is a very welcome surprise.

The plot is fairly standard. Collect the apples, avoid the nasties, jump on the platforms and away you go. The huge variety of those nasties and the large range of platforms – some stationary, some moving, some disintegrating – is quite something when you think about just how little memory the authors had to play with. I think they have every reason to be very proud of their creation.

The music is unsophisticated (to say the least) and the 'tune-off' key was particularly welcome. There is the usual pause/restart option and a demonstration mode which gives you a glimpse of the 10 different screens, some of which you will pass through more than once.

Perhaps the most striking feature of the game is the velocity at which our



hero marches along. If you are the impatient type you will enjoy racing through the screens of *Contraption*. Even with this speed, however, movement is very smooth – in short, the graphics are a joy. *Contraption* is a very polished piece of software and if any game is to keep the platform theme alive then this is probably the one that can do it. **David Acton**

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Owls lead to late night addiction

'Boffin', Addictive Games, BBC B and Electron, £9.95

NOWADAYS it seems a game will only take off if it a) employs an entirely original idea or b) uses an old idea but is presented in a new and interesting way. *Boffin* falls into the second category: what it lacks in originality it certainly makes up for in presentation. The graphics are reminiscent of *Frak!* and the platform scenario is hardly new but I nevertheless found *Boffin* quite enchanting.

As you might expect, the purpose of



the game is to collect all the examples of a particular object on the screen. These happen to be horseshoes in *Boffin* but they might as well have been crystals or cricket bats. Having safely gathered the horseshoes, you must make your way to the owl which sits patiently in some inaccessible corner of the screen. When you reach it you will be rewarded with bonus points galore and be permitted to proceed to the next screen.

There are actually two versions of *Boffin* supplied on the tape – *Boffin* with 20 screens and *Boffin 2* with 25. Note that only *Boffin 2* will work on the Electron. Each screen has obviously been carefully created to be challenging but not impossible – clearly a great deal of thought has gone into each version.

The name of the game comes from the white-coated, umbrella-carrying hero. Other characters include manta-bats, giant puffer blimps and tarantulas – graphically, all of the highest standard. Unlike many platform games, not everything that moves will instantly vaporise you if you step too close. Some of the characters may even help you in your task although quite how is something you must discover for yourself!

Of course the true test of any platform game is its addictiveness. *Boffin* scores highly in this department and has resulted in many late nights! So, if you are content to settle for a game which lacks a fresh concept but is presented in a way that rivals many a best-seller, then *Boffin* may well meet your requirements.

David Acton

Racing madness

'Chicane', Kempston Microelectronics, Tel: (0234) 856633, BBC B, cassette £7.95 (disc £9.95)

AMONG the plethora of motor-racing simulations which have been offered over recent months only a small selection's been worthy of praise. While *Chicane* is of a standard that would have made it a best-seller in the past, today it has little to distinguish it from the numerous alternatives.

It would be wrong to say that the graphics are not up to scratch. Both graphics and sound are more than adequate for a game like this. The passing scenery is perhaps a little stark, consisting only of road signs – not even a cactus to obstruct your view of the distant, snow-covered mountains of Monza. Or the mountains of Monaco. Or the mountains of Silverstone...

Special features include two wing-



mirrors and a wide choice of tracks. You may also specify the number of laps in a race. Deficiencies include the lack of a speedometer – a somewhat crucial omission, I think.

Cheats will run riot with *Chicane*. For example, you can knock 10 seconds off the record lap time by driving around the edge of the track rather than on it. If your engine overheats you can park in the middle of the road until it cools off without fear of being overtaken – a certain amount of respect for race etiquette is a must for this game!

The true mark of a good racing simulator is the angle you lean at in your armchair as you hurtle round the hairpin bends so, if you can forget for a while its inaccuracies and shortcomings, *Chicane* scores fairly highly on the realism scale. However, I think that its deficiencies are a little too great to be ignored, especially when compared to simulators like *Revs*.

David Acton

Space strategy

'SIM', Consolidated Software Marketing, BBC B and Electron, £7.95

SIM is described as 'an arcade strategy game', but doesn't quite come up to scratch on either count. As regards the arcade action, you have to steer your spaceman hero through the sky and into tunnels, corridors and rooms, using just Left, Right and Boost for his jetpack, and avoiding the nasties such as flying saucers, snakes and giant rabbits. Even the fluffy clouds are liable to detonate on impact – in fact, everything that moves should be avoided. The scope for action is pretty limited and, since your pacifist hero has no means of hitting back, it's one long round of dodging and weaving.

As for the strategy, your aim is to collect a load of 'Simarils', whatever they are, and dump them in a 'reactor', for some obscure reason. This doesn't take a lot of strategic planning: in each screen (and there are plenty) the moving objects behave the same way every time you enter, so you can soon figure out your best evasive action. There are a few useful objects lying around – like a giant carrot for the giant rabbit – and a few bizarre items to avoid (would you believe radioactive seaweed?).

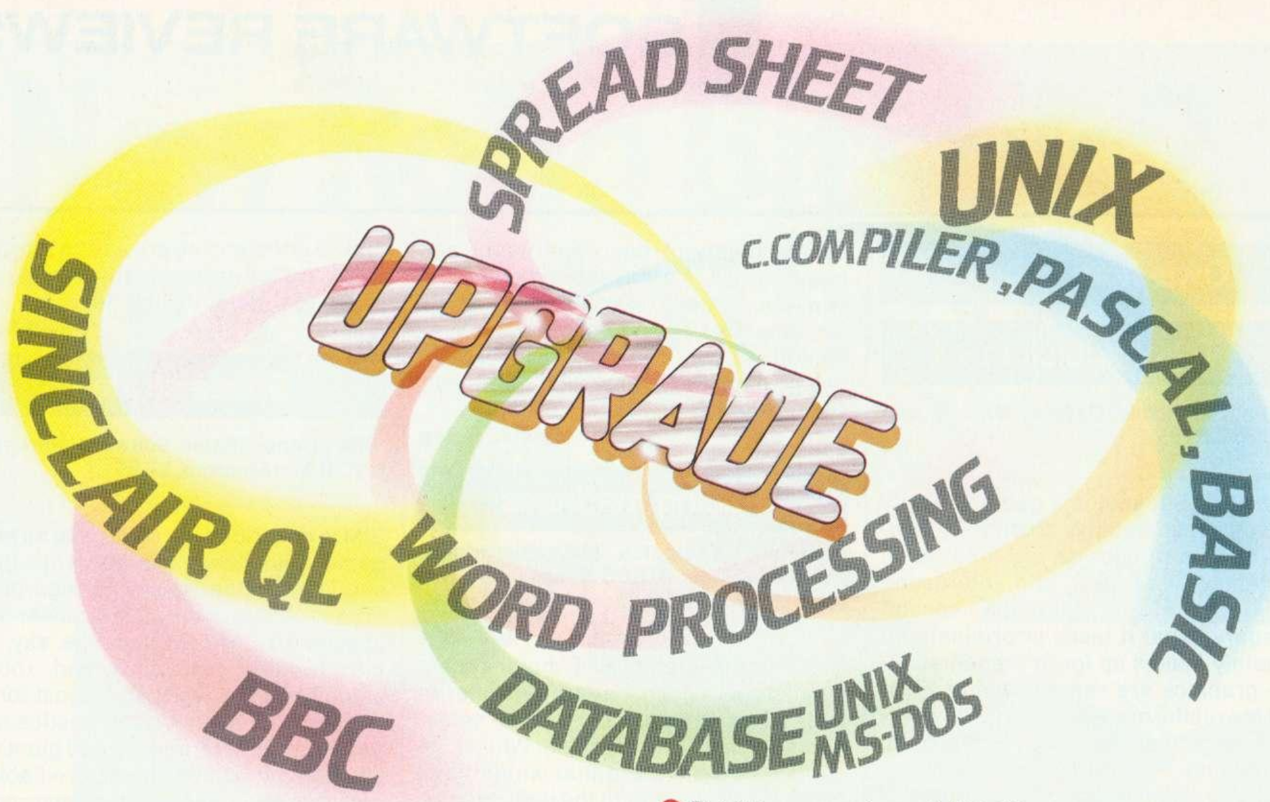
SIM has some irritating features, like the nauseating little tune which plays throughout the action unless you remember to turn it off every time you start a sequence. And the fact that there's no scrolling: when you fly off the left of one screen, a new one is drawn



immediately, with you entering right. Rather confusing.

In its favour, it must be said that there's a lot of it. There are plenty of screens, and it will take the most digitally dextrous player quite a while to learn to dodge around the whole area collecting Simarils.

Jeffery Pike



SPREAD SHEET
UNIX
C.COMPILER, PASCAL, BASIC
UPGRADE
SINCLAIR QL
WORD PROCESSING
BBC
DATABASE
UNIX
MS-DOS

COMPILERS COMPARED

Three systems scrutinised by Bruce Smith

EXPLAINING terminology is a dull way of starting any review. However, many readers will be new to the subject of compilers, so I make no apologies for laying down some groundwork before progressing to my main task.

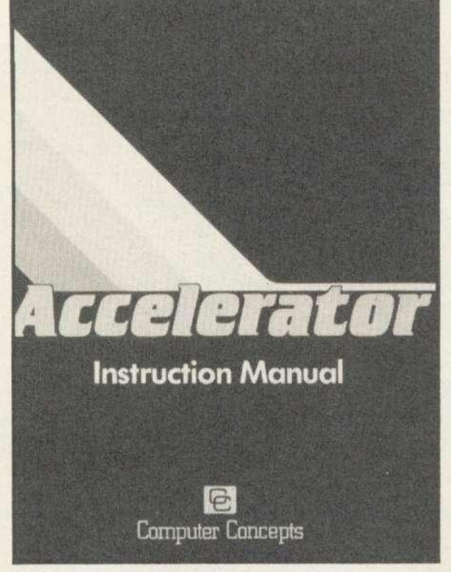
There are two ways in which a programming language can be implemented. The most common is the interpretive method – BBC Basic is a typical example. In such languages the computer has to interpret every instruction that makes up the Basic program by identifying each Basic command against a list of its own commands held internally. As it identifies each command it extracts an address of a machine code routine held within the Basic ROM which performs the tasks specified by the Basic command.

Once this machine code routine has been executed, the interpretive part of the Basic ROM regains control and then seeks to identify the next command in the program in a similar way. This process of identify and execute must take place *every time* a Basic command is encountered. It's very time-consuming, but as the micro is operating at 'the speed of lightning', it's often not really noticed.

A more efficient language, in terms of speed and space, is a threaded interpretive language, such as Forth. When a program is written in Forth, the Forth interpreter compiles a list of addresses. Each of these refers to the execution address of some machine code, and when the program is run the Forth interpreter simply picks out each address from the list it has compiled and jumps to each in turn to execute the machine code there.

Compiling languages take two forms – those that compile to an intermediate code and those that compile all the way to the base machine code itself.

There are very few languages that compile all the way down from a program to true machine code and these are only generally available on the biggest computers. Machine code programs compiled in this way, however, have distinct advantages and disadvantages. The main advantage is that the machine code in many instances, though not all as we shall see, runs much faster, because it is running at the machine speed – 2MHz in the case of the Beeb. The disadvantages are that the machine code (in all but few cases) is much longer than the original source program, because the machine code is normally assembled with a library of machine code subroutines into which it can jump. As this is a general purpose library, it must cope with all conditions and is therefore not tailored to our exact requirements, resulting in much redundancy of code.



CC's manual: a good introduction

So much for the theory. The three compilers reviewed here all take a Basic program as their source and compile it either to a pseudo code form and/or a machine code form. Each performs its task in a slightly different manner so I'll look at each in turn.

Pineapple Software Compiler

This is supplied on a 40-track disc and contains a conversion program to allow it to be transferred to 80-track. It is the only one of the three that compiles directly to machine code and does not require the user to go through an intermediate pseudo code assembly stage first. All compiling is performed to and from disc files. The compiler is menu driven and booting the disc provides you with your options – all of which are quite straightforward.

First write and debug your Basic program in the normal way and save it to disc. The program must then be reformatted by the compiler which means stripping all the wasted space out of it, such as REMs, etc, undertaken using a menu option.

Re-booting the menu, you can select the actual compilation option and assembly address of the object code. Once this is done the *Compiler* loads in its own library routines and then compiles your own Basic program to it. Finally you can save the machine code. All that now remains is for the machine code to be run in the normal way.

Unlike the other two, the *Pineapple Compiler* is the only one that will allow you to include assembly language in your programs to be compiled. There are, of course, restrictions – each program line must begin and end with square brackets, and it's not possible to refer to a label in another line. This is not a real problem, though, and is easily solved as described in the accompanying 30-page manual.

Listing 1 shows a typical use of assembly language in a pre-compiled Basic program suitable for compiling with the *Pineapple Compiler*.

As the Pineapple is a disc-based compiling system it's quite easy to perform multiple file compiling and to compile overlays. Again this proves to be quite straightforward and examples are provided in the manual.

The *Compiler* has the ability to assemble your code so that it conforms to the sideways ROM (SWR) format.

Name	Accelerator	BCOMP	Compiler
Manufacturer	Computer Concepts	Logik Engineers	Pineapple Software
Format	24k × 2 ROMs	16k ROM	Disc
Pseudo code	Yes	Yes	No
Machine code	Yes	No	Yes
Cost	£64.40	£49.95	£25

Table 1. What the three compilers have to offer

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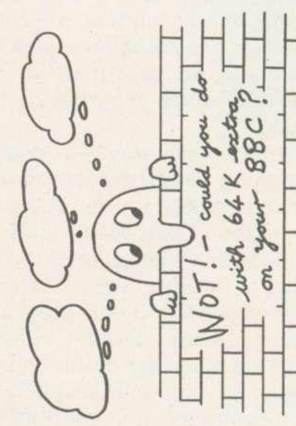
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STARSTORE 2 Allows up to 65535 very large (18000 chars.) records	£44.95
ELKMAN – Rom Manager	£17.50
STARMON – Machine Code Monitor	£22.50
PDG – Printer Driver Generator for STARWORD Cassette £7.95	Rom £9.95
T2P3 – Tape to Disk Rom	£19.95
STARGRAPH – Graphics Rom	£21.95
PRINTER ROM – All printing requirements	£24.95

BBC PRODUCTS

STARWORD – sophisticated wordprocessor	£34.50
STARSTORE – Database	£29.95
STARSTORE 2 very powerful database	£44.95
BEEBMAN – Rom Manager	£17.50
STARMON – Impressive Machine Code Monitor	£24.95
PDG – Printer Driver Generator for STARWORD	£9.95
TREK – ROM disassembler with a difference	£22.95
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PRINTER ROM – For all printing requirements	£24.95
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However it must be said that its author has been extremely short-sighted here, as it will only assemble your code at &8000 – it will not assemble it into normal memory and then allow you to reload it at will. This means that unless your SWR allows you to assemble directly into it you will not be able to use this option.

BCOMP Compiler

BCOMP is supplied in a 16k EPROM which plugs directly into your machine. This compiler will only compile to its own pseudo code, called b-code, and does not support compilation of machine code.

The *BCOMP* ROM supports four commands – *COMPILE, *CSAVE, *CRUN and *CINFO. Once you have a Basic program ready for compiling (ie, it has been tested and debugged in Basic), the command *COMPILE will compile to b-code almost instantly. The b-code itself is placed above TOP and does not damage your existing program in any way. The b-code is executed with *CRUN, and if all is well you can save the b-code with *CSAVE. The final command *CINFO provides a detailed information sheet about the b-code program.

*COMPILE can be used with up to three parameters. The full command is:

*COMPILE [%I16] [%DBG] [filename]

Any or all may be used as required. The %I16 parameter forces the compiler to use standard 16 bit integer variables in place of the standard 32 bit values. This can save you a significant amount of space when dealing with programs containing large integer arrays.

The %DBG option is the debugging option; neither the *Pineapple Compiler* nor *Accelerator* contain such a useful facility. This will assemble line numbers into the b-code that can be used in conjunction with Basic's TRACE ON/OFF facility allowing errors to be pinned down to the line they occur in. Error trapping and messages themselves are comprehensive. Finally by specifying a filename, a program may be compiled to and from disc source and object files.

As already mentioned, *BCOMP* does not support the compilation of assembly language statements, but it is possible to call pre-prepared object code with CALL and USR. The indirection operators could of course be used to poke machine code into memory from the b-code if desired. Another facility lacking on the *BCOMP Compiler* is the ability to create b-code programs in SWR format. Having said that, a disc containing *BSIDE* is available to do just this. The SWR produced is independent of *BCOMP* as it includes the run-time system into the ROM image. The cost of the disc is £14.95.

Accelerator

Computer Concepts' compiler has been a long time coming, and has grown into two EPROMs giving you a grand 24k compiler and needing two ROM sockets inside your Beeb.

The manual supplied is a good introduction and leaves you knowing just what is happening at each stage, plus how and why. *Accelerator* will compile Basic programs to G-Code and these can be ported into machine code with the aid of a conversion program on the dual format disc supplied in the pack.

```
   10 REM Print ? twice
   20 CLS
   30 PROCquery
   40 PRINT"That's all!"
   50 END
   60 :
   70 DEF PROCquery
   80 [:LDY #2:LDA #&3F:
.q JSR &FFEE:DEY:BNE q:]
   90 ENDPROC
```

Listing 1. Program containing assembly suitable for *Pineapple* compiling

Accelerator can compile to or from disc or directly in memory. Using it is simple – first prepare and debug your Basic program. Enter *ACCELERATOR or an abbreviation and you will be led by the hand with prompts for source filename name and object filenames. Enter both in turn or press return if the source Basic program is in memory and the object code is to be in memory. The program is compiled, its length displayed, and you are asked if you wish to execute it, then you're deposited back in Basic.

To run a previously saved G-code program use the *GRUN command. As with the compiler this prompts for a source name, loading it in if given, and runs it straight away. If the object filename is omitted then the interpreter, which is one of the two ROMs, looks for the G-code above a Basic program stored at PAGE.

Converting from G-code to machine code is performed via a utilities disc. The command *CONVERT invokes this and, as usual, you are prompted for filenames. The utilities disc contains a library of machine code files. There are three levels of files, each supporting more routines than the previous one, which is useful as it means that for simple programs you need only load in the smallest machine code library file that will support your program. Once the machine code library has been assembled your G-code is added to it and, bingo, you can save the lot.

Producing sideways ROM is performed in a similar fashion, except that you use a special machine code library file. Some extra string information is also requested such as title, copyright and HELP messages.

Two other utilities are supplied. RELOC allows you to reconfigure your G-code to run at an address other than the one for which it was compiled. LIBGEN lets you generate a machine code library for any assembly address.

Unlike the other two compilers, *Accelerator* will run on the 6502 second processor with Hi-Basic. It contains no real debugging aids other than a comprehensive set of error messages.

Benchmarks

I should point out that I have not tested the three compilers under review to anywhere near their fullest potential, and I suspect that it will take some time for me (and you) to do so – I look forward to receiving comments through the Beeb Forum pages. However I have devised a limited set of eight benchmarks (listings 1-4 on the yellow pages) that will work on all three compilers and involve a degree of number crunching which is normally where the

Benchmark	Basic	BCOMP	Acc1	Pineapple	Acc2	Acc3
1	23	20	22	1	8	8
2	201	75	68	12	19	19
3	463	275	289	102	114	114
4	463	242	254	100	99	99
5	783	338	383	12	131	131
Bytes used	838	439	669	2195	3925	6944

Table 2. Results of the Benchmark tests

Benchmark	Basic	Pineapple	BCOMP	Accelerator
6	237	—	117	126
7	1396	—	1403	1197
8	1944	—	1409	1506

Table 3. How the compilers coped with 'off the shelf' programs

real time saving can be gained when using compilers. Table 2 shows how each fared, with times listed in 100ths of a second. The bottom row contains the number of bytes the final compiled version occupies.

The figures make interesting reading. The first column contains the timing results for Basic to allow you to make comparisons. Columns two and three are the pseudo code timings for *BCOMP* and *Accelerator* (Acc1). *BCOMP* wins for speed on four out of five occasions; the compiled b-code is also about 30 per cent less than that of the G-code.

The last three columns contain figures for the machine code compiled by the *Pineapple Compiler* and *Accelerator* level 1 and level 3 libraries (Acc2 and Acc3 respectively). In all but one test (benchmark 4) the *Pineapple Compiler* is faster. The difference of 0.01 second in benchmark 4 is hardly worth noting however, but the numbers at the bottom are. *Accelerator* level 1 uses almost twice as much space, and level 3 over three times as much, for the compiled machine code. It should be borne in mind, however, as table 3 shows, that *Accelerator* compiles a greater degree of Basic than the *Pineapple Compiler* and this is, of course, reflected in the run-time libraries produced by the compiler.

Table 3 lists some times in 100ths of a second obtained using benchmark programs 6, 7 and 8. These programs were taken 'off the shelf' as it were and no special adaptation was performed.

In each case the *Pineapple Compiler* was unable to cope, so was the *Accelerator* machine code converter. This is acceptable as they weren't written to spec. Timings for the pseudo codes of *BCOMP* and *Accelerator* were mixed. In one case (benchmark 7) *BCOMP*'s b-code was actually slower than Basic! The only other really notable figure was in the bytes used by the programs (not shown). In benchmark 8 *Accelerator* needed 492 bytes for its G-code – longer than Basic's 346 bytes for the program, including REMs!

Summary

I was rather impressed by all three systems. All go about what is at first sight a most complex process in a very simple way. *BCOMP* is easiest to use, but it does not have the range and ability of *Accelerator*. The *Pineapple Compiler* is a bit more involved as it requires use of discs at all times.

At this point I should say a few words with regard to the sale of programs written with the compilers, say for SWR use. Obviously these will be using routines supplied by the compilers. In the case of *BCOMP* this includes a 9k run-time b-code interpreter which *BSIDE* includes in your ROM image. Logik Engineers will license this to the user for a £500 blanket payment or at £1 per ROM sold. Both Computer Concepts and Pineapple Software make no charge for the use of their routines compiled with their software, other than an acknowledgement in your documentation.

Making a choice between the three is difficult. The *Pineapple Compiler* is a very useful tool, cheap in comparison to its two competitors and compiles direct to machine code. It's more difficult to use as it has fewer compilable commands and requires use of disc.

The *BCOMP* compiler compiles only b-code, and very efficiently. It does not support machine code and SWR assembly is only possible with the purchase of an extra disc, which would make it comparable in price to *Accelerator*. *Accelerator* does the lot, but at a price. It's more expensive, and needs two ROM slots and a disc to do it all. It's generally slower in operation than its counterparts, but that's probably because it has more ground to cover.

Bruce Smith's benchmark listings are on yellow page 120

WHAT THEY OFFER

Accelerator

Manufacturer	Computer Concepts, Gaddesden Place, Hemel Hempstead, Hertfordshire HP2 6EX
Requirements	OS 1.2 or later Basic 1 or Basic 2
Compatibility	Will work with 6502 second processor and Hi-Basic. Disc-based with provisions for tape users
Format	24k ROM – (two ROMs) G-Code Compiler G-Code Interpreter Machine code converter disc Manual and reference card
Sideways ROM	Yes. (No royalty charge)
G-Code	All commands implemented except EVAL, LOMEM, PAGE, TOP, TRACE, assembly language
Machine code	Three libraries available. The following commands are not implemented on any level – COS, DEG, ERL, EVAL, INT, LOG, LOMEM, ON GOTO, ON GOSUB, PAGE, PI, RAD, SIN, SQR, TAN, TOP, TRACE
Numbers	Reals supported by G-Code 32 bit integers 16 bit integers in machine code conversion only

BCOMP

Manufacturer	Logik Engineers, 84 Portnalls Road, Coulsdon, Surrey CR3 3DE
Requirements	OS 1.0 or greater Basic 1 or Basic 2
Compatibility	Will not work with 6502 second processor Disc-based with provision for tape users
Format	One 16k ROM Compiles b-code only Does not compile machine code Supplied with manual
Sideways ROM	Possible using b-code, needs *BSIDE* disc Royalty charges: £500 blanket payment or £1 per ROM
G-Code	All commands implemented except EVAL (partially), assembly language
Machine code	Not available
Numbers	Reals supported 32 bit integers may be set to 16 bit

Pineapple Compiler

Manufacturer	Pineapple Software, 39 Brownlea Gardens, Seven Kings, Ilford, Essex IG3 9NL
Compatibility	Will not work with 6502 second processor Disc-based only
Format	40-track disc (with 80-track copy routine) Manual
Sideways ROM	Yes. No royalty charge
G-Code	Not available
Machine code	The following commands are not implemented on any level: COS, DEG, ERL, EVAL, INT, LOG, LOMEM, PAGE, PI, RAD, SIN, SQR, TAN, TOP, TRACE
Numbers	16 bit integers only

INTEGRATION THE FACTS

INTER-SHEET and INTER-CHART are the first of a new generation of integrated packages for the BBC Micro. They are more powerful and much easier to use than any other similar application program.

The ROM-LINK concept is unique to this range of programs; it ensures that all ROM-LINK programs are totally compatible and truly integrated.

The word 'integrated' has been much abused recently. In our eyes 'integrated' should mean that all programs in the range should share a common data format, that it should be possible to transfer data directly from one program to another (not just by saving and loading) and it should be possible to have multiple programs resident in the machine at once. The integrated programs in the ROM-LINK series are the only ones that can do this.

The ROM-LINK system allows up to 16 packages to be resident in memory at the same time. It makes no distinction between any of the packages, so that you could have up to 16 separate spreadsheets stored in memory or (more usefully) a few spreadsheets, a few graphs and a couple of documents being word processed. It is a simple matter to transfer data from any package into the one in current use, and because the packages are resident in memory, the data transfer is very fast. It is also possible to use data from other packages without actually transferring, thereby saving memory.

Put simply, this means that INTER-SHEET can use multiple spreadsheets and use data from one sheet in another sheet, and INTER-CHART can plot graphs using data taken directly from a spreadsheet. When INTER-WORD and INTER-BASE are available then these will be able to use data from the other packages in the same way.

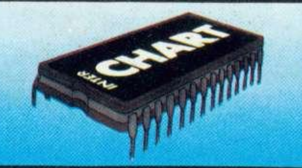
FACTS

INTER-CHART

The chart and graph plotting program

This general purpose graph and chart plotting program allows the user to display data in the most easily understood manner—graphically.

Two quite distinct sorts of graphs are catered for. 'Labelled' graphs that always have fixed increments on the X axis like yearly sales figures, and 'scaled' or scatter graphs. These allow both the X and Y values to be specified.



Data can be entered into the system from three distinct sources: Typing at the keyboard is the simplest method, but data can be read from ASCII files produced by WORDWISE, VIEW or a programming language such as BASIC. Because INTER-CHART is ROM-LINK compatible it can also import its data directly from other ROM-LINK packages such as INTER-SHEET.

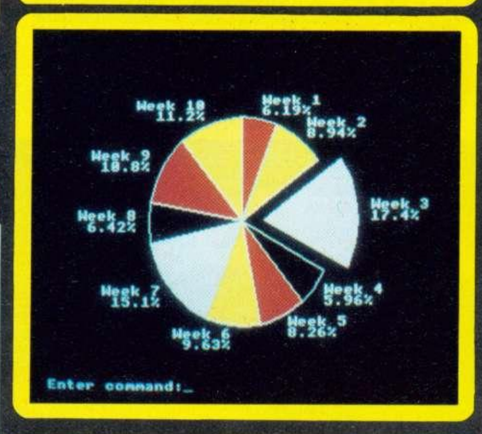
Once the data has been entered a straightforward editor allows any previous data to be altered or new values to be inserted at any position.

TEXT WITH GRAPHS: Labels are normally printed along the X-axis for lines and bars. Pie charts have their labels and values printed around the chart. These may be optionally switched off. With a pie chart the values may be replaced with a percentage figure. All graph displays can have additional labels or messages printed at any position on the screen using a powerful label editor. This allows headings to be easily added to graphs. These labels are stored with each graph when saved.

COMPATIBLE WITH: All shadow RAM boards and the 6502 2nd processor. However the ROM-LINK facilities are not available when using a 2nd proc., these include multiple INTER-CHARTS and direct data transfer from other ROM-LINK programs.

PRICE: £36.80 incl.

INTER-CHART allows up to 16 graphs to be held in memory at the same time as one 'package'. Each graph is named and, once entered, any named graph can be selected from a simple menu display.



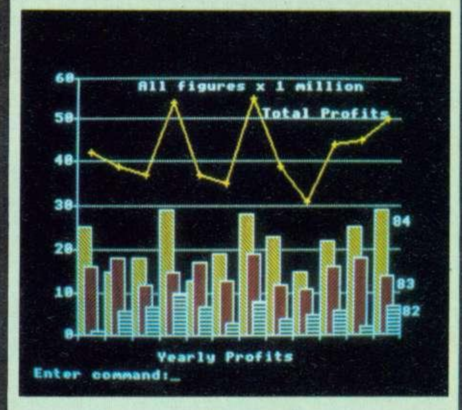
SCREEN DISPLAY: The graphs can be displayed in any of the BBC's graphics modes. The colours of the bars, lines or segments can be altered in a simple table of colours. This also allows special striped colour combinations and for bar charts a variety of cross hatching styles is available. It is also possible to use a VDU19 statement to alter the colour palette.

DISPLAY OPTIONS: Where appropriate (not pies, etc) either axis can be displayed as a log or linear scale, and there is an option to display dotted graduation lines on either axis. Pie segments and bars can be highlighted (segment 'pulled out').

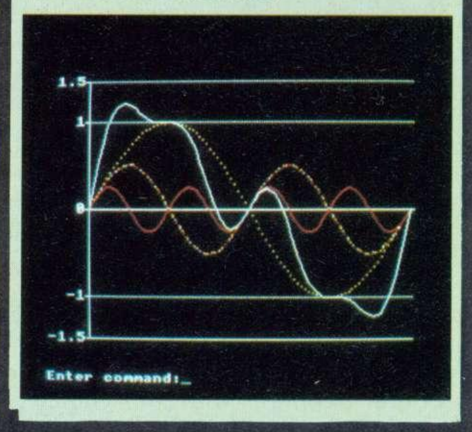
PRINTERS: INTER-CHART has a built in screen dump routine for all EPSON matrix printers and compatibles. It is possible to use other screen dump routines from within (or external to) INTER-CHART for other printers or plotters.

FILING OPERATIONS: Any named graph can be saved or loaded individually to disc or cassette, or all graphs can be saved together in one file.

GRAPH TYPES: INTER-CHART supports the three main graph types, lines, bar charts and pie charts. Scatter graphs are also catered for and can be displayed as points or lines.



SCALING: INTER-CHART automatically scales the graph display to cover the full range of values entered. INTER-CHART can cope with numbers in the range 2E-39 to 2E+38. It is possible however to force the scale independently on the X and Y axis to show any specified range, including the option for log scales on either or both axes.



FUTURE RELEASES

Both INTER-SHEET and INTER-CHART are available now. INTER-BASE and INTER-WORD are under development at the moment, and are likely to be released in early 1986. Both are fully ROM-LINK compatible so that they will be totally integrated with the others in the range.

INTER-WORD is an 80 and 105 column word processor (not 40 columns). This will be a 'WYSIWYG' word processor showing the page on screen exactly as it would appear on the page, including page breaks, headings/footings and centered lines, justification, margins, etc. It will also handle 'continuous' documents on disc up to the capacity of your filing system.

Like all of our products this will be smooth and very fast in operation, and of course very easy to use. Editing operations will be similar to WORDWISE but this is not totally WORDWISE compatible. There will be an exchange arrangement available to WORDWISE owners—more details available nearer the release date.

AVAILABILITY: Winter 85/86
PRICE: Approx. £49.00 + VAT

INTER-BASE will simply be the most powerful database available. This will operate with all disc filing systems and have a very large data handling capacity. It will contain a powerful BASIC-like programming language with full string and mathematical operations.

This will work at 2 levels, a simple user interface will allow card-index like operations but, via the programming language, the system can be easily tailored to the individual needs. Up to 250 fields per record, each field up to 32K long. This would enable the user to store complete documents in the database. Variable length fields and records.

AVAILABILITY: Early 1986
PRICE: Approx. £59.00 + VAT

INTER-SHEET

FACTS

The electronic spreadsheet program

FILING OPERATIONS: Load and Save entire sheet. Save specified part of sheet. Load part of sheet to any sheet position. Spool sheet to file. Save all ROM-LINK packages. Load all ROM-LINK packages.

IMPORT/EXPORT: Export any part of sheet for use in word processors. Import sheets created on word processors. Import data directly from other ROM-LINK packages.

PRINTING: Print all or specified part of worksheet. Print with or without sheet borders. Print with or without held lines (windowing). Sheets titles can be printed and control codes can be sent to the printer. Print all formulae. The pound sign code can be altered to a sequence of codes for different printers.

AUTO-STEP: Whenever an entry has been made the cursor can automatically move one box up, down, right or left.

CELL DISPLAY: Any box (cell) can be displayed left or right justified. Labels can also be centered. Numbers may be displayed in three formats, exponent, fixed or general format. The number of digits is controllable from 0 to 10.

LOCKING: Any box, row or column or all boxes can be locked to prevent accidental alteration.

LABELS: Formulae can refer to other boxes in the normal way (e.g. A1 or G5) but can also refer to boxes in a much more meaningful way via labels (e.g. JAN SALES), the box referred to is at the intersection of the column and row of the specified labels. Labels are not restricted to being placed on the borders of the sheet only.

REPLICATION: Any box or area can be copied to any other box or area on the sheet, giving total flexibility. The replication is very fast—see comparisons. Single key operations for inserting or deleting a row or column. Formulae can automatically be altered, if desired, relative to their new position.

OPTIONS: A variety of spreadsheet defaults can be altered, such as the default box justification, number format, sheet area. Screen colours are easily alterable.

WINDOWING: A unique system that allows any row or column (or multiple rows and columns) of the sheet to appear at a fixed position on screen, still allowing the sheet to scroll underneath. Far easier to use and more flexible than other windowing systems.

INTER-SHEET and the rest of the ROM-LINK series belong to the 2nd generation of application programs for the BBC Micro. They are larger, more powerful and easier to use than any previous products of this sort.





Some further facts about INTER-SHEET:

CURSOR MOVEMENT: WORDWISE-like cursor movement allowing the user to move left or right one box, one screenful or to the extremes of the used sheet area. A further command allows immediate movement to any specified box.

SCREEN DISPLAY: Single key switch for 40, 80 and a special 105 column screen mode. This allows much more of the spreadsheet to be visible on screen at once. The 105 column mode requires no special monitors—if you can read the 80 column mode then the 105 will work perfectly well.

SHEET SIZE: 64 columns by 255 rows. Each box can hold up to 80 characters. Column widths are variable up to 31 characters wide. There is no gap between boxes so labels can continue across boxes.

MATHS: A full range of maths functions is included. There are also additional special spreadsheet functions such as AVERAGE, COUNT, IF . . ., LOOKUP, MAX, MIN, SUM, BOX and SQRS (sum of the squares). Numbers can range from 2E-39 to 2E+38 and can be printed to 10 significant figures.

INTER-SHEET offers many quite unique features.

1. The fastest spreadsheet—see comparison box
2. The largest capacity—see comparison box
3. 40, 80 and special 105 column screen mode
4. Multiple spreadsheets in memory at once
5. Data transfer between sheets in memory
6. Data transfer to and from word processors such as WORDWISE and VIEW
7. Menu operation and fully prompting commands
8. Complete documentation. 2 manuals, an introduction and a reference, are supplied along with a quick reference card.
9. Will integrate directly with INTER-CHART and other ROM-LINK compatible products.

```
INTER-SHEET 0
(C) Computer Concepts 1985

1) Save worksheet
2) Load new worksheet
3) Save part of worksheet
4) Load worksheet to cursor
5) Load ASCII worksheet
6) Print worksheet
7) List formulae
8) Spool worksheet
9) Set Options

ESC worksheet display

Please enter choice_
```

ROM BASED SOFTWARE FOR THE BBC MICRO

The first published review of INTER-SHEET says:

"... It offers higher capacities than any previous Beeb spreadsheet, but it runs significantly faster than Lotus 1-2-3 and Symphony on the IBM-PC,"

"INTER-SHEET is quicker, has more features and is cheaper than either of its competitors. If the remainder of the "Inter-" series are as good as this Acornsoft and the rest better look to their laurels. Software of such quality can only make the Beeb even more attractive as a business machine."

Gordon Taylor—A&B Computing Sept. 85

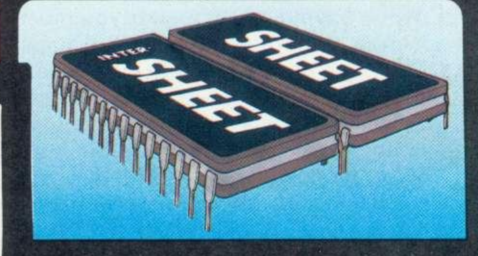
PRESS

Spreadsheet comparisons

Times in seconds	VIEW-SHEET	ULTRA-CALC 2	INTER-SHEET
Replicate SIN(PI) into boxes A1 to Z50	66	65	7
Recalculate the above	28	33	5
Number of bytes free with above sheet	4664	1415	8400
Price (Exclusive of VAT)	£52.00	£69.13	£49.00

COMPATIBLE WITH: Shadow RAM boards such as the Aries B20 and Watford electronics 32K RAM board. Because the ROM-LINK system needs to switch ROMs INTER-SHEET is not compatible with the 2nd processor, although a HI version of INTER-SHEET will be available for the 6502 2nd processor (No ROM-LINK facilities and no 105 screen mode). INTER-SHEET is supplied in 2 ROMs, but if you only have 1 socket then only the ROM-LINK facilities are lost (multiple spreadsheets etc).

PRICE: £56.35 incl.





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SCREEN TEST TAKE TWO

Chris Drage peers into nine assorted monitors

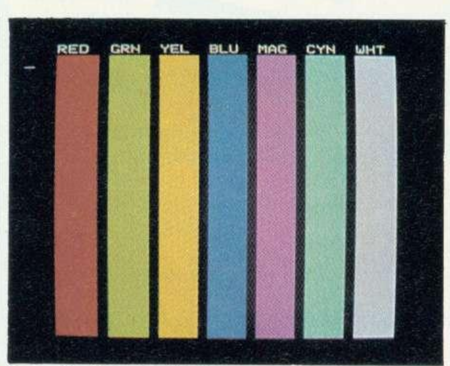
CHOOSING the right visual display unit (VDU), to complement your micro can be a problem, and complicated further by sales people who quote 'pixels, resolution, slot pitch' or this feature versus that. In the end it's really a matter of what looks right to you and what you can afford.

Anyone concerned about their eyesight and the quality of their computer's display quickly realises that a monitor is essential to make the most of lovely multi-coloured graphics – the family TV just won't do. Reading 80-column text on anything other than a medium to high resolution monitor for any length of time is foolhardy to say the least.

The range of VDUs has increased along with the facilities on offer, and there are also now TV/monitors available, which can operate as standard colour televisions but also have an RGB circuit bypassing the normal UHF circuitry, giving a very steady display with better colour saturation. I have selected five monitors and two TV/monitors which represent the choice.

To compare them I have used the suite of test routines published in *Acorn User*, June 1984, which are repeated on page 178. You may find these useful when evaluating any VDU you may consider purchasing. The program is menu-driven allowing you to perform each of the tests at the touch of a key: press the space bar to return to the menu. You'll find details of what the tests are and how the monitors performed in the boxes on the following pages.

When buying a TV/monitor you must accept a compromise, and the Philips CT2007 is a prime example – an excellent television receiver, it only just makes the grade as a standard colour monitor. The geometry may be 'out' (review model only passed tests E and F satisfactorily), and there are no external adjustment controls. The TV/monitor switch is located inconveniently at the rear of the cabinet and it looks like a portable TV rather than a monitor, with a retractable carrying handle and, a loop aerial. The review model suffered badly from the BBC micro's interlacing 'judder', to the extent that 80-column work was difficult. However, the overall effect is certainly far better than a TV utilising a UHF signal, and it compares favourably with a Microvitec 1531 standard monitor.



Result of Test 1. It allows you to check richness and clarity of colour

Newark Video are offering converted Grundig P40-125GB sets. Like the Philips, this includes circuitry to display RGB signals, but is the first TV/monitor to actually look like a monitor. I was impressed with the positioning and range of controls, and it's good to find the TV/monitor switch located with the contrast/brightness controls at the front of the cabinet. The Grundig is one of the new breed of TVs featuring the FS (flat square) tube, and is the only one in my experience to show considerable improvement over conventional TV tubes. The picture is sharp and clear and the colours excellent.

As a monitor its slot pitch of 0.41 and tube capability of 11,000 characters (580 × 680 pixels) speak for themselves and it can happily hold its own with many medium-resolution monitors. 80-column text work is a practical proposition with the Grundig. Other features include a Scart connector on the rear which will accommodate composite signals and audio, and a convenient carrying handle. This unit is highly recommended.

The tests

Test A
Fills the screen with random lower case characters in mode 0. Each character should be distinct and easily read.

Test B
Alternating inverse Ms and Ws. Monitors find these letters difficult to resolve. Check particularly at the screen edges.

Test C
Causes the screen to flash alternately between black and white, testing if the monitor's power supply can cope with rapid changes. The effect of the screen collapsing inwards is normal. The build-up of the white screen should happen instantly, however.

Test D
Prints 15 horizontal bars across half a mode 0 screen. The spaces between each white bar should be uniformly black as should the right-hand side of the screen. Uneven shades of black indicate the low frequency of the monitor.

Test E
The border drawn round the screen should be straight and fit on the screen evenly on all sides.

Test F
The solid circle drawn in mode 0 should be central and show no signs of being oval.

Test G
A severe test of a monitor's ability to resolve colours and keep a steady screen. Each band should be distinguishable.

Test H
A monitor should be able to display and remove text/graphics instantly. No image should remain on the screen after the text is removed.

Test I
The colour test is included to enable comparison of the clarity, richness and depth of the colours (or shades).

If the Grundig is a TV which looks like a monitor then the JVC Electrohome ECM1302-2 is a monitor masquerading as a TV. Not one of the most attractive or lightweight sets, it performed the tests extremely well. It was reviewed in *Acorn User*, April 1984, and I cannot add to George Hill's findings.

I was disappointed in the lack of picture controls on this hi-resolution monitor – only a brightness control was easily accessible (three other controls are well buried inside the cabinet to the rear). Plus points include excellent 80-column text display, vivid colours and steady pictures. In value for money terms this monitor holds its own.

Data Distributors now market the latest Kaga Electronics range of Taxan monitors in the UK. The Vision 3 and the Vision 2, a medium resolution monitor, are still available. Styled in an attractive plastic cabinet, this monitor will appeal to those who, because of lack of space, must sit close to the VDU, and a clip-on anti-glare screen is also provided. My only grumble is the lack of a carrying handle.

The seven picture alignment controls situated at the back are adjusted with the special tool provided, and a single brightness control is located at the front. The Vision 3 performed all the tests creditably. Its bright colours and steady picture combine to make it a pleasant VDU to work with. Although it's capable of 80-column text I would not recommend it for continuous word-processing in this mode. You'll need a hi-resolution monitor for that.

At the top end of the market is the attractive Supervision 3 hi-resolution monitor. Completely restyled, it features a new high-contrast, non-glare tube which allows more light to pass through (a boon to lightpen users). Designed for business use, the SV3 includes a text-only mode, with a choice of three text/background colours in this mode. The choice of green on black simulates quite accurately a green-screen monitor, while the black text on white background is the steadiest and sharpest I have ever seen. Like the Vision 2, a battery of picture controls is situated at the rear, with contrast, brightness and the text-mode switch at the front. An optional swivel stand with quartz clock is also available. With all its bells and whistles and a £429 + VAT price tag, you would expect this monitor to achieve straight As on every test – and it does! In graphics mode (white on black), I judge the Vision 3 to have a slight edge with 80-column text, but the SV 3 certainly wins hands down in its text mode. This excellent monitor would be equally at home in a business environment using IBM PCs as it is with a BBC.

The Taxan KX1202 is one of the new breed of green-screen monitors featuring a P-39 long persistence phosphor tube giving a rock-steady picture and an end to 'flicker'. The KX1202 is housed in a cream cabinet with an integral carrying handle, a flat screen and anti-glare tube. Eight picture adjustment controls, including contrast, are situated at the rear with only the brightness control at the front.

The KX1202 performed well in most of the tests, especially resolving 80 characters. It fell down badly on two points, however – it would not resolve blue satisfactorily (which remained invisible despite turning both the contrast and brightness full on), and the long persistence tube makes it unsuitable for animated graphics, as the screen becomes a jumble of decaying and new images. In fact, I found the latter annoying when using the KX1202 for 80-column wordprocessing. Another problem concerns ambient light – the monitor became unusable in a bright, sunny

Warning!

There are slight hazards involved in using any VDU using a cathode ray (television-type) tube. Health and Safety guidelines govern places of work, but not your home. If you use your computer for prolonged periods read the booklet by the Health and Safety Executive called *Visual Display Units*, published by HMSO.

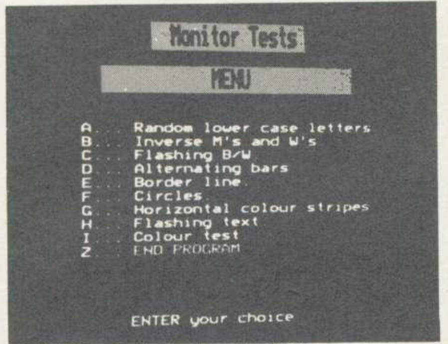
There is no evidence of any danger to pregnant women from the VDU, but they should avoid the prolonged, fixed, staring posture associated with using VDUs, particularly if they use computers for many hours a day.

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	Electrohome ECM 1302	Grundig P40-125 RGB	Philips CT2007	Philips BM 7502	Taxan KX-1202	Taxan K12R2 Vision 2	Taxan K12SV3 Supervision 3
Manufacturer (country)	JVC (Japan)	Grundig (UK) (modified by Newark Video Centre)	Philips	Philips (Taiwan)	Kaga Electronics (Japan)	Kaga Electronics (Japan)	Kaga Electronics (Japan)
Purpose	Standard RGB monitor	PAL colour television/RGB monitor (36mm)	PAL colour television/RGB monitor (36mm)	Green screen monitor (also amber BM 7522) 30mm non-glare screen	Green screen monitor (also amber KX-1203) 30mm non-glare screen	Medium resolution RGB monitor	High resolution RGB monitor (non-glare screen)
Dimensions (width x depth x height)	470 × 385 × 325mm	375 × 365 × 365mm	450 × 410 × 430mm	305 × 303 × 280mm	355 × 320 × 292mm	320 × 393 × 303mm	332 × 365 × 309mm
Weight	14kg	13kg	12kg	6kg	7kg	12.5kg	12kg
Screen resolution	580 × 470 pixels	580 × 680 pixels		2000 characters (80 × 25)	2000 characters (80 × 25)	510 × 262 pixels	640 × 262 pixels
Band width	10MHz			Better than 20MHz	Better than 20MHz	Better than 15MHz	18MHz
Slot pitch	0.41mm	0.42mm	0.65mm			0.47mm	0.37mm
User controls	Brightness, vertical hold, vertical height, horizontal hold	Station selection buttons, volume, self-seek tuning, brightness, contrast, head/earphone socket	Brightness, volume, colour, contrast, 12 preset tuner selectors, headphone socket, speaker mute switch	Brightness, contrast, volume, vertical hold, vertical height, horizontal hold, horizontal position	Brightness, contrast, vertical hold vertical size, vertical linearity, vertical position, horizontal size, horizontal hold, horizontal position	Brightness, contrast, vertical hold, vertical size, vertical linearity, vertical position, horizontal size, horizontal hold, horizontal position, focus	Brightness, contrast, vertical hold, vertical size, vertical linearity, vertical position, horizontal size, horizontal hold, horizontal position, focus
Inputs	RGB analogue/ TTL input	Video (AV) DIN, Euro-AV (Peri)	RGB analogue, Video (CVBS)	Composite Video, Audio	Composite Video	RGB separation	RGBI direct drive system (TTL + OR−)
Price (inc. VAT)	£199.95	£299	£219	£85	£136.85	£327.75	£493.35
Review copy obtained from	Opus Supplies, 55 Ormside Way, Holmethorpe Industrial Estate, Redhill, Surrey. Tel: (0737) 65080	Newark Video Centre 108 London Road, Balderton, Newark, Notts NG24 3AQ. Tel: (0636) 71475	Viglen Computer Supplies, Unit 7, Trumpers Way, Hanwell, London W7 20A. Tel: 01-843 9903	Viglen Computer Supplies, Unit 7, Trumpers Way, Hanwell, London W7 20A. Tel: 01-843 9903	Data Distributors, 5 Kings Ride Park, Ascot, Berks SL5 8BP. Tel: (0990) 28921	Data Distributors, 5 Kings Ride Park, Ascot, Berks SL5 8BP. Tel: (0990) 28921	Data Distributors, 5 Kings Ride Park, Ascot, Berks SL5 8BP. Tel: (0990) 28921

Table 1. All you need to know about the nine monitors reviewed in this article

room, and the brightness control could not cope, leaving the screen extremely faint. It may be worth checking out the amber screen model as it may not suffer from these problems quite so mark-



Typing in and running the listing on page 178 will present you with this menu

edly. In all the KX1202 is unimpressive and over-priced at £119 + VAT.

This is not the case with the Philips BM 7502. Its neat, cream cabinet features a movable support to enable the monitor to be tilted to a convenient position. The lack of a carrying handle is inconvenient, but as the monitor weighs only 6kg, it's not too serious, and it has the bonus of an audio input socket and volume control. Five picture alignment controls are situated at the rear, while contrast and brightness are neatly and conveniently housed at the front. The BM 7502 performed all the tests well. Although it did not quite match the Taxan in resolution or steadiness, it nevertheless performed well in ambient light conditions. If you require a straightforward monochrome monitor suitable for either 80-column work or general use, the Philips BM 7502 will not disappoint. An excellent monitor at a realistic price.

There are many factors involved in your decision as to which VDU to buy. If a budget-priced, general purpose, colour VDU is required then, without hesitation, the JVC Electrohome should be high on your list as it is excellent value for money. If the cost of a dedicated monitor puts you off, then the Philips CT2007 will appeal, as it combines a good TV receiver with an equivalent standard resolution monitor at a sensible price. If you are a business user or writer then the Philips BM 7502 will meet your requirements. For those who can afford it and really want to get the best combination, then without a doubt the Grundig P40-125GB is in a class of its own – I have never seen a TV/monitor which can resolve 80-column text so well. Not surprisingly,

Test A produces lower case letters in mode 0, which should be easy to read

the SV 3 wins hands down in all departments except in price. Excellent though it is, an enthusiast has to be either very rich or extremely dedicated to choose this one. The business user or dedicated few who want the best need look no further than the Taxan SV3.

One word of advice before parting with your readies – ask the retailer to set up the TV or monitor and run the test program through it! All VDUs vary quite considerably from unit to unit despite manufacturers' claims to the contrary.

	Grundig P40-125	Philips CT2007	JVC ECH 1302-2	Taxan K12SV3	Taxan Vision 2	Philips BM-7502	Taxan KX1202
Price	£302.16	£225	£199.95	£429	£285	£85	£119
Test A	4	3	5	5	3	5	5
Test B	4	3	4	5	3	5	5
Test C	4	3	5	5	4	4	4
Test D	5	4	5	5	4	5	4
Test E	4	3	4	4	4	4	4
Test F	5	3	3	4	5	4	4
Test G	4	2	4	5	4	3	5
Test H	5	4	5	5	5	4	1
Test I	5	4	5	5	5	4	2
Total	40	29	40	43	37	30	34
Value for money	4	4	5	3	3	5	2

5 *Excellent*, 4 *Good*, 3 *Satisfactory*, 2 *Poor*, 1 *Very bad*

Overall performance: 5 *Excellent*, 4 *Good*, 3 *Satisfactory*, 2 *Poor*, 1 *Very bad*

George Hill adds . . .

A brief statement on the Microvitec Cub monitor, by George Hill

FOLLOWING my review of two monitors in the April 1984 issue I was criticised by Microvitec (and readers) for my remarks about their Cub monitor.

The criticism was that I had unfairly compared the JVC high resolution monitor to the Microvitec low resolution one. My defence is that comparison was based on something much more important – price. In the April 1985 issue the lowest prices I found for the JVC high resolution was £199.95, and for the Cub were a low £185, medium £259 and high £299.

In this review I'll look at the Microvitec Cub 653 and see how the JVC has fared in the meantime.

The medium resolution Cub is at least the equal of the JVC in clarity and quality of colour and resolution. The unpleasant picture shake which bedevilled the low resolution monitors seems to have disappeared largely. The most stringent monitor test is to attempt to distinguish adjacent black and white lines in mode 0 and neither monitor can do this, producing shades of grey. The resolution of both was perfectly satisfactory for 80-column text in modes 0 or 3, and both performed well in coloured stripes tests.

Both suffer from a lack of picture controls. JVC has a front-mounted brightness control and Microvitec a rear mounted contrast control. Both appear to perform the same function – more like a brightness control than contrast.

Health and Safety guidelines recommend that sets should be easily adjustable for differing light conditions. The rear mounted controls on the Cub make this very inconvenient, and leaning across the equipment might lead to unpleasant contact with a highly charged screen if used in a dry atmosphere. Any other adjustment to either set involves removal of part of the case.

There are a number of models of Cub monitor. The one I had – standard in many schools and colleges – was in a metal case without carrying handles, and is badly balanced. It is designed for placing in a fixed relationship to the computer and not to be moved around.

The JVC, now 18 months old, has aged a bit. The screen background is no longer as dark as it was, and there is a slight misalignment which gives a very faint yellow tinge to the pattern produced by the black and white line test. Otherwise it continues to perform as well as ever.

If you currently use a television set or a low resolution monitor, either of these will give a significant reduction in eye strain and improved comfort.

Chris Drage's nine-test program to check the visual quality of monitors

```
   10 REM Monitor Tests
   20 REM by Chris Drage
   30 REM for BBC B/B+ and Electron
   40 REM (c) Acorn User June 1984
   50 :
   60 MODE 7
   70 *FX 11,0
   80 *FX 15,0
   90 FOR V=1 TO 2
  100 PRINT TAB(5,V)CHR$141CHR$132CHR$15
7SPC(3)CHR$134CHR$157CHR$132"MONITOR TES
TS "CHR$157SPC(4)CHR$156
  110 NEXT
  120 FOR W=4 TO 5
  130 PRINT TAB(6,W)CHR$134;CHR$157;CHR$
141;CHR$132," MENU";SPC11;CHR$156
  140 NEXT
  150 PRINT''TAB(5)"A... RANDOM lower ca
se letters"
  160 PRINT TAB(5)"B... RANDOM inverse M
's and W's."
  170 PRINT TAB(5)"C... Flashing B/W."
  180 PRINT TAB(5)"D... Alternating bars
."
  190 PRINT TAB(5)"E... Border line."
  200 PRINT TAB(5)"F... Circles."
  210 PRINT TAB(5)"G... Horizontal colou
r stripes."
  220 PRINT TAB(5)"H... Flashing text."
  230 PRINT TAB(5)"I... Colour test."
  240 PRINT TAB(5)"Z... ";CHR$131;"END P
ROGRAM"
  250 PRINT'''TAB(10)"ENTER YOUR CHOICE
.";
  260 ON INSTR("ABCDEFGHIZ",GET$)GOTO 30
0,390,500,600,710,780,860,960,1070,270
  270 MODE 7
  280 END
  290 REM Random lower case letters
  300 MODE 0
  310 CLS
  320 FOR N%=1 TO 2560
  330 C=RND(26)
  340 VDU C+96;
  350 NEXT N%
  360 REPEAT UNTIL GET=32
  370 GOTO 60
  380 REM Alternating inverse Ms and Ws
  390 VDU 23,240,156,156,148,148,128,136
,156,255
  400 VDU 23,241,255,156,136,128,148,148
,156,156
  410 CLS
  420 MODE 0
  430 FOR Z%=1 TO 16
  440 FOR Y%=1 TO 40:VDU 240,241;:NEXT Y
%
  450 FOR X%=1 TO 40:VDU 87,77;:NEXT X%
  460 NEXT Z%
  470 REPEAT UNTIL GET=32
  480 GOTO 60
  490 REM Flashing B/W screen
  500 CLS
  510 MODE 0
  520 FOR T%=1 TO 15
  530 VDU 19,2,0;0;
  540 FOR delay=1 TO 1000:NEXT
  550 VDU 19,2,7;0;
  560 FOR delay=1 TO 1000:NEXT
  570 NEXT T%
```

Continued ▶

◀ Continued

```
  580 GOTO 60
  590 REM White bars test
  600 MODE 0
  610 VDU 23,240,255,255,255,255,255,255
,255,255
  620 FOR Z%=1 TO 16
  630 FOR C%=1 TO 40
  640 VDU 240
  650 NEXT C%
  660 PRINT:PRINT
  670 NEXT Z%
  680 REPEAT UNTIL GET=32
  690 GOTO60
  700 REM Screen border
  710 MODE 0
  720 MOVE 2,2:DRAW 1277,2
  730 DRAW 1277,1021:DRAW 2,1021
  740 DRAW 2,2
  750 REPEAT UNTIL GET=32
  760 GOTO 60
  770 REM Solid circle
  780 MODE 0
  790 MOVE 740,512
  800 FOR C=0 TO PI+PI STEP0.01
  810 DRAW 640+100*COS(C),512+100*SIN(C)
  820 DRAW 640+500*COS(C),512+500*SIN(C)
  830 NEXT C
  840 REPEAT UNTIL GET=32
  850 GOTO 60
  860 REM Horizontal bands of colour
  870 MODE 2
  880 FOR I%=0 TO 1023 STEP4
  890 GCOL 0,(I%/4 MOD8)
  900 MOVE 0,I%
  910 DRAW 1279,I%
  920 NEXT I%
  930 REPEAT UNTIL GET=32
  940 GOTO 60
  950 REM Persistence test
  960 MODE 1
  970 *FX 9,60
  980 *FX 10,70
  990 VDU 19,3,15;0;
 1000 FOR X%=1 TO 10
 1010 PRINT"A TEST FOR PERSISTENCE."
 1020 PRINT:PRINT
 1030 NEXT X%
 1040 REPEAT UNTIL GET=32
 1050 GOTO 60
 1060 REM colour test
 1070 MODE 7
 1080 H%=5
 1090 FOR Y%=2 TO 20
 1100 FOR I%=1 TO 7
 1110 B$=STRING$(3,CHR$(&90+I%)+STRING$(
4,CHR$(255))+CHR$(10)+STRING$(5,CHR$(8))
)
 1120 PRINT TAB(H%*I%-3,Y%)B$
 1130 NEXT I%
 1140 NEXT Y%
 1150 PRINT TAB(0,1);"   RED  GRN  YEL
BLU  MAG  CYN  WHT"
 1160 REPEAT UNTIL GET=32
 1170 GOTO 60
```

See also Chris' article in June 1984 where he looked at the Novex 1414, the Kaga Vision 3, the Sanyo DM8112CX and the Novex 12/500MG



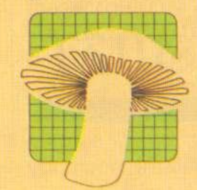


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Broadway Electronics, 55 Tavistock Street, Bedford, MK40 2RF
Telephone: (0234) 58303. Telex: 826112 MUSCOM G, and selected computer dealers nationwide.

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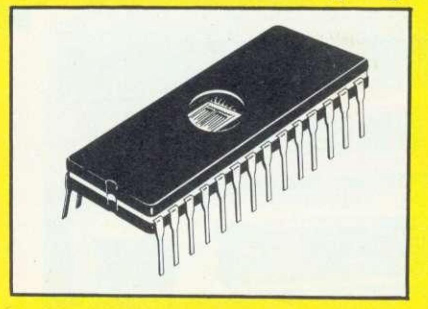
Your BBC now has the true multi-tasking potential of much bigger machines.

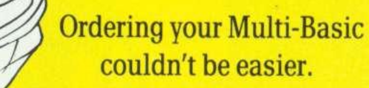
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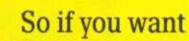
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Utilities for Art

AMX Utilities, £14.95, Advanced Memory Systems, Green Lane, Appleton, Warrington WA4 5NG

THE AMX Mouse is one of the most enthralling peripherals I've ever used with my Beeb. I'd assumed it would be much like using a glorified joystick – in fact it is so natural, it's more like writing or drawing than using a micro at all. Perhaps this is why the *Art* program suits the Mouse so well.

Although *AMX Art* is a great introduction to the mouse, once you start using it in earnest you begin to see it has a few shortcomings for serious applications. It is, for instance, hard to work in detail on small areas of the screen. If you're doing a symmetrical drawing, it's difficult to draw both halves identically. It would also be useful to be able to use icons with *AMX Art* and to design your own fill-patterns (not everybody's into drawing houses!).

AMX Utilities attempts to get round these problems. The package consists of a disc and accompanying manual. There are 31 files on the disc, covering the new routines, menus to link them together and a number of sample files to play around with or use in your own drawings. There are also copies of *AMX Art* – with a few minor bugs removed – and the icon designer.

The manual is similar in layout to the *AMX Art* manual, and is again well illustrated. It advises 80-track disc users to convert the disc from 40 to 80 tracks, and provides a program to do it. I was a little perturbed at the thought of rewriting my master disc, and more worried when I realised that the disc supplied had no write-enable cut-out.

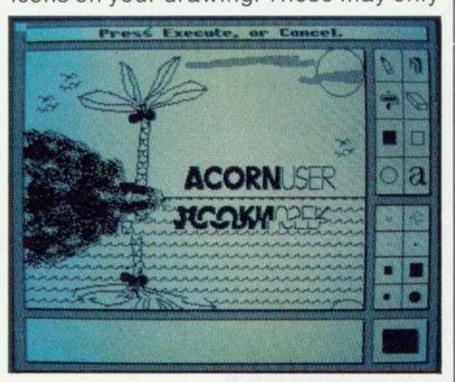
The routines are all called from the main menu by clicking the mouse button twice, as with *AMX Art*. As well as the utilities program, there are routines to design fill-patterns, to strip pictures suitable for printing, and to build up your own XDUMP routines to print them. There is also a short program to build up a 'slide show' of mouse-generated pictures, and a sketch program which gives you some of the *Art* facilities, but in mode 2.

The utilities program itself offers four main facilities: Zoom, Copy, Cures and Icons. Although you can use any of these routines on a new drawing, it is easier to start by loading in an *AMX Art* picture. If you then load Zoom, a small window appears beside the picture window, and this shows the area of the picture which will be enlarged when you zoom in. When you do, each pixel is magnified in the main window and you can turn any one on or off in a similar way to the icon designer. You can use Zoom to 'tidy up' pictures, or to draw directly to the pixel.

To copy a section of a picture you define a source rectangle over the area you want to copy, and the program produces a destination box the same size and shape, which you can move to any part of the picture. You can then copy from one to the other, either pixel for pixel or reflected and/or rotated through 90, 180 or 270 degrees.

The curves option allows you to draw ellipses and arcs by manipulating up to three different cursors. The curves can be superimposed on an existing drawing or drawn and later enhanced.

The icon routine allows you to call any icon file and position individual icons on your drawing. These may only be placed in character positions (as with characters when you have selected 'gridlock' in *AMX Art*).



There are a couple of points which detract from the add-on utilities. It's a shame you can't directly carry a drawing across from *AMX Art*, or even call the utilities from the main *Art* screen. Instead you have to save your file, reboot the system, run the utilities and reload the file. Perhaps a later version will integrate the package.

Overall, though, *AMX Utilities* is a very welcome offering, and deserves to boost the popularity of the Mouse even higher. At the price asked, it's exceptional value.

Simon Williams

Desk or paper?

AMX Desk, £24.95, Advanced Memory Systems, Green Lane, Appleton, Warrington WA4 5NG

ONE of the main uses of a computer 'mouse' is to make life easier for busy executives. It takes control of many of the micro's functions and leads the user away from the keyboard and into a more ergonomic environment, where moving the mouse around on a desk moves a corresponding pointer on the computer's screen.

The AMX Mouse, which appeared about a year ago, promised to do this for the BBC micro, but it has taken until now for the first business-orientated software to be released. *AMX Desk* offers a graphic business environment, from which you may select other application programs. You may also use its own simple facilities to help make your business life easier.

After you've told *AMX Desk* the date and time, the first main screen displays a series of icons down its right-hand side and pull-down menus along its top. The icons include four disc drives, a telephone, sheet of paper, printer, calendar, alarm clock and dustbin. You can call any of *AMX Desk*'s built-in functions by moving the mouse pointer and clicking the executive button over the appropriate icon.

Pointing to any of the disc icons will catalogue the disc, either in graphical or textual form, and you can run any of the displayed programs by pointing to them on the screen.

The telephone icon calls up a name and address index, and you select entries by their initial letters. A second screen then shows all the names listed, and by pointing to a name you can display the corresponding address and telephone number. You only need to move away from the Mouse when making new entries. On a 40-track disc you can hold about 600 names and addresses and still have 10k free for memos.

The memo pad is an embryonic wordprocessor. It allows for centring and justification of text, wraps words from one line to the next, but will only print 32 characters across the page. Still, if you've ever owned a Spectrum...

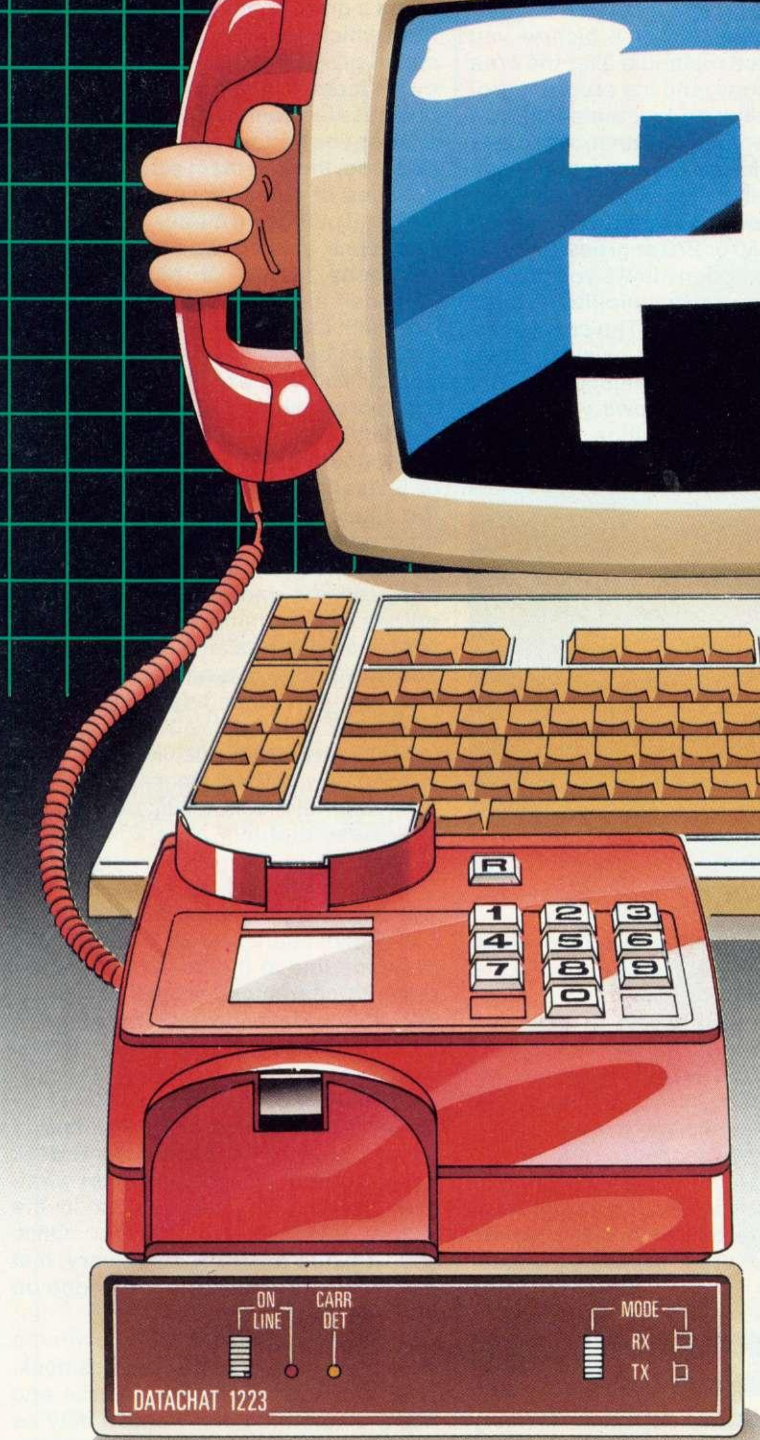
The calendar shows three months, based around the current one, and may be pushed forward or back to show other periods of the year. Pointing to any day on the calendar leads into desk diary for that day. You can enter whatever notes you want, subject to the space allocated on screen. Once you've made an entry in the diary, that day is highlighted in reverse video on the calendar.

A calculator is available over the main desk screen or the address book. This is operated using the mouse and has a single memory. Results may be transferred to a 'scrap-pad' for later inclusion in a memo.

The whole system works very smoothly, and is clearly explained in the well-illustrated manual. The only query left is whether anyone will use this kind of program on a home micro. I guess if you make continuous use of your Beeb you may find it worthwhile, but I still wonder if paper and pen isn't quicker and easier.

Simon Williams

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Block in your options

'Options', £20 (plus VAT) and 'Blockfit', £40 (plus VAT), System Software, 12 Collegiate Crescent, Sheffield, S Yorks, tel: (0742) 682321

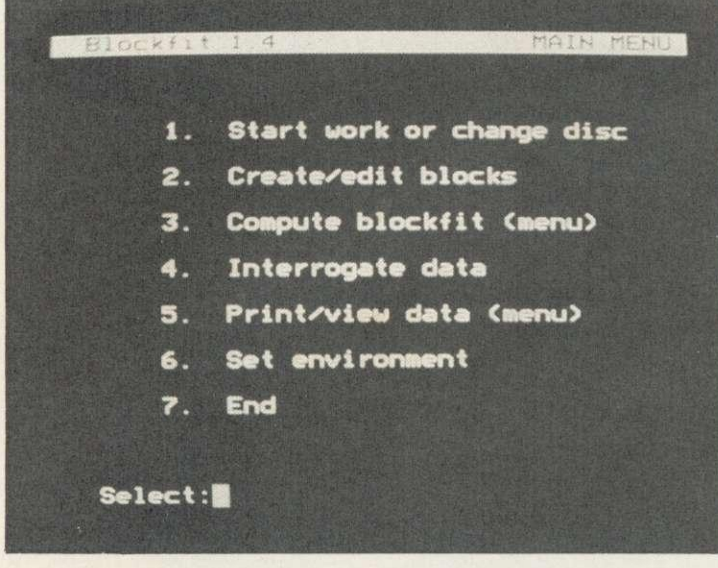
THE perils of timetabling and secondary school third-year options management are never brought home to a teacher so clearly as when these tasks are dumped on his plate. Usually the province of a deputy head teacher, they generally require many hours of juggling with figures and resolving seemingly insoluble contradictions where a pupil has chosen subjects 1, 2, 3, 4, 5 and 6 but it appears to be only possible for him to do subjects 1, 3 and 5 plus Applied Maths, Outdoor Pursuits and Tree-felling. The juxtaposition of all the subjects necessary to fit in the one awkward customer is sometimes beyond one's patience, endurance and logical reasoning. Multiply that problem by half the population of the third year in your school and you have some idea why the deputy head seems to fade into obscurity during the last part of the term!

Options and *Blockfit* are two allied programs, designed to alleviate the problems outlined above by providing a database specifically tailored to the needs of the timetabler.

From the information in the database you can work out how many students have chosen a particular option, clashes between choices made that will be untenable under the structure laid down, 'blocking' of the groups so that timetabling strictures may be imposed from the start of the analysis. All this provides a thorough and flexible program which is geared to the needs of schools where pupils choose their subjects freely from a wide range, or for those restricted by a blocking system in the first instance.

Options is menu-driven and so is quite easy to follow. Data is input into the system in a way which has been cleverly designed to protect against typographical error. Subject names or cyphers are predefined so that when PHY is to be input, pressing just P will conjure up that cypher on the screen, unless there is another subject with the same initial letter. I have been informed that it is good timetabling practice to identify subjects with at least two-letter cyphers.

A total of 40 possible subject choices may be defined initially and, within these, there is also the possibility of assigning three sub-groups to the main subject making a total of four groups per option. So, for example, GEOG, GEOG1, GEOG2, GEOG3 may indicate Geography O-level, Geography O/CSE, Geography CSE, Geography non-exam. As each pupil record is created there is space for 16 option choices, which means that pre-determined factors such as English and Maths sets, PE groups, RE sets and so on may be entered and yet not necessarily be part of the process of creating the option blocks.



Searching and interrogating the data is simple – just follow the menus through to the required destination. However, because there is such a multiplicity of branches from the main menu one can get a little lost in the maze occasionally but practice makes perfect and one can always press the Escape button. In common with its partner program, *Options* is much easier to follow when using a printer – the data is well laid out and easy to understand when it is printed. One may choose to print the data for a single pupil, for a form, all the data on the disc, list all the pupils, catalogue the forms or calculate the totals taking each option and within each set – an important preliminary to blocking with the *Blockfit* program. Consideration is also given to the fact that it may be relevant to divide pupils by sex for some subjects, and so totals are given separately for male and female and then brought together as an end-total.

Having created the data-file on the year group concerned, one may then turn to the *Blockfit* program. This is a sophisticated sorting program enabling the user to try out various permutations of options within the block structure as governed by the school timetable and staff resources. This means that the original data may be left unaltered but is fitted against the structure until a 'best fit' is achieved. By changing both the groupings on the original data file and the structure of the blocks one is able to achieve the best compromise.

After entering the password one is able to create or edit the blocks which govern the organisation of the children into option groups, actually process the blockfit (a task which takes an average of 10 seconds), interrogate the data as in *Options*, and print the data in various forms.

Each option block may contain up to 24 sets as previously defined by the *Options* package. In addition a staff cypher may be added to identify the teacher for each individual group within the block. Having established each of the blocks one may perform any of the tasks defined by the *Blockfit* menu. Each time a task is performed the whole block-fitting computation is repeated so that any alterations are accounted for. One tends to print only the summary in the initial stages in order to see how best the blocks might be changed around. This is useful since it's difficult to gauge whether a particular revision has improved matters or not if several factors have been changed.

A table of clashes may also be printed, showing individual pupils and their chosen subjects who did not fit into the scheme separated from their main subject list. This is exceptionally clear and an invaluable aid to revision of the original data files.

Having created the perfect fit (!) one may then go on to print out set lists, complete with subject cypher, staff cypher, block number and set number, pupil name, sex and form.

Overall, this set of programs is most impressive. Their impact on the timetabling strategy of a school would only be appreciated in full, I think, if the timetablers were willing to give up their current methods and try out the more adventurous 'free choice followed by computer blocking' system.

It is an expensive package but it performs an important task. The questions to be asked are how valuable is your timetabler's time and how much do you value his or her sanity? **Nick Evans**

EPROMERS ON PARADE

Simon Williams compares three EPROM programmers

LARGE numbers of BBC micro owners will have some EPROMs in their machines, apart from the MOS and Basic chips. The design of the machine encourages commercial programs to be installed in these chips (by 'blowing' the EPROM), so that the user of the program has instant access to it. Many people will also have installed sideways ROM boards to extend this capability from four up to the full complement of 16 chips.

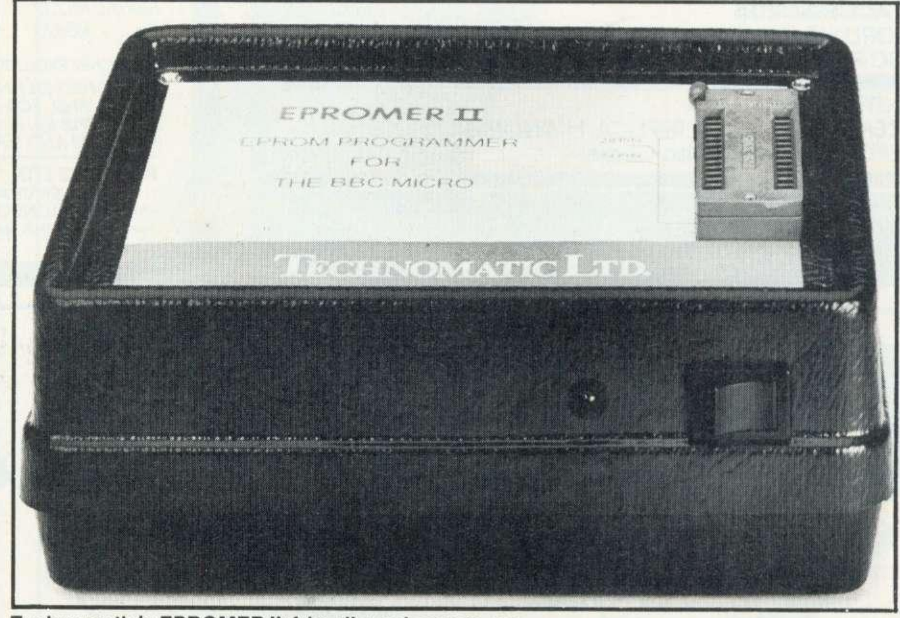
If you have written programs of your own, either in Basic or machine code, you may like to consider the idea of blowing your own EPROMs, so that your programs, too, will be available at the touch of a few keys. If you are considering marketing your creations, it may well prove to be an advantage to offer a version on EPROM as well as on disc and cassette. To do this you will need an EPROM programmer, or 'blower', and a UV (ultraviolet) eraser. This review compares three EPROM programmers and the software which comes with them.

M423 EPROM Programmer, £132.25, CTL, Unit 11, Burmarsh, Marsden Street, London NW5 3JA. 01-482 2177.

EPROMER II, £116.72, Technomatic, 17 Burnley Road, London NW10 1ED. 01-208 1177.

EPROM Programmer, £79.95, Viglen Computer Supplies, Unit 7, Trumpers Way, Hanwell W7 2QA. 01-843 9903.

CTL, Technomatic and Viglen all set about their EPROM systems in rather different ways. CTL's programmer is a neat, wedge-shaped, black plastic box, with an integral fold-over lid. Inside is a metal front-plate from which protrude two LEDs (light-emitting diodes), a zero insertion force (ZIF) socket and a short piece of ribbon cable which plugs into the 1MHz socket underneath your BBC micro. The whole unit is compact and very portable, although the power supply is a separate unit, built into the mains plug.



Technomatic's EPROMER II: friendly and easy to use

Technomatic's programmer is built into a bulkier black plastic box, with no cover, and sports the obligatory ZIF socket, an on/off switch with an LED and a longer length of ribbon cable, again for the 1MHz socket. The power supply for this unit is integral, and it comes complete with a mains plug. This programmer, although robust, would probably be happier left in an office or laboratory.

Viglen's unit is mounted in a plastic case which is much the same as you would find around one of their single disc drives. It, too, has a ZIF socket mounted on top, together with a power switch. At the back is a three-position rotary switch, which controls the programming voltage, and the mains lead, but this time without a plug. A separate ribbon cable is supplied which links, at one end, into a socket on the front of the programmer, and at the other, into the 1MHz bus.

All the units worked very well, and did everything they were intended to do. As all three systems offer very similar facilities the differences are largely dependent on the software supplied with each unit.

The CTL programmer will handle EEPROMs (*Electrically* Erasable PROMs) as well as the regular variety, so when EEPROMs become more popular (and their prices drop) this facility could be an added bonus. The Technomatic unit allows you to blow Basic programs into an EPROM, one at a time if you like, and provides a machine code loader so that you can

call the programs with a '*' command. Basic programs, of course, are loaded into RAM before they're executed, so there's no saving in memory from doing this. It's much faster than disc loading, though.

Both the CTL and Technomatic units will handle all the common EPROM types, including the 32k 27256 chips, although these are programmed 16k at a time. The Viglen programmer only takes 8k 2764s and 16k 27128s, but these are the two most common types used in the Beeb. All three units support high-speed, 'intelligent' programming algorithms for EPROMs that can use them.

The CTL software is supplied in ROM, and a function keystrip is also provided. All the utilities are controlled using these keys, and the screen display shows a hex dump of the section of RAM holding the program you are going to blow into the EPROM.

Above this display are various other bits of information, including the currently selected EPROM type. The hex display is automatically adjusted to the length of the EPROM being used. You can mark and manipulate blocks of RAM independently of the whole. These blocks may be of any size from one byte up to the full length of the EPROM.

The Technomatic software, which is available on cassette, disc or ROM, produces a very well organised display – it shows the EPROM type in use, the base, start and finish addresses of the current code, and offers eight selections from a menu. One of these is a hex dump, so you can manipulate code in hex or ASCII before committing it to your chip. You can load files from tape, disc or another EPROM (for copying chips), and when programming an EPROM a display of time to completion is maintained. The software gave the impression of being extremely robust, handling silly input politely and keeping the user informed of what was going on.

The software supplied by Viglen is completely menu-based. It is obviously intended for the non-technical user, and is heavily error-trapped. You are reminded to switch off the power before inserting or removing EPROMs, and to select the right programming voltage for each type of chip. Although it does what it does well, you are working pretty blind with this package. There's no hex dump, or any other way of manipulating your program before committing it to the EPROM.

Everything is done automatically for you. If you're happy leaving it to the system, then this approach may well suit you – it extends to two utility programs, also supplied, which prepare machine code programs for use from service or language ROMs. The presentation of the programs looks a little tatty, though.

All these three systems are soundly thought out, quality products, which perform their designed functions well. I found the Technomatic software easier to use and more friendly, but the CTL program was by no means awkward to follow. I would, though, have liked more control than the Viglen software allowed.

The only other quibble I have is with CTL and Technomatic over the price of their programmers. Although there must be a fairly limited market for this equipment, it still seems somewhat over the top to charge £100+ per unit. There are other programmers on the market costing significantly less (and less than the Viglen unit, too), which appear to offer most, if not all, the features of the units reviewed here. When you bear in mind that someone thinking of investing in this kind of equipment is also going to need an EPROM eraser (costing another £40 to £50), it's not altogether surprising that the current market is small.



CTL's unit will handle both EEPROMs and EPROMs

	CTL M423	EPROMER II	Viglen
Hex dump	●	●	–
Block manipulation	●	–	–
Blank check	●	●	●
Read	●	●	●
Write machine code	●	●	●
Write Basic	–	●	–
Verify	●	●	●
Intelligent algorithm	●	●	●
Handle EEPROMs	●	–	–
Software supplied	In ROM	On cassette, disc or ROM	On disc
Power supply	In plug	Integral	Integral

Table 1. Features of EPROM programmers

A not so basic editor

'Basic Editor', Acornsoft, £29.90

THIS 16k ROM has been a long time coming, and I must say I'm surprised no one has been tempted to take the bull by the horns and beat Acornsoft to it long ago. As it happens the story of this ROM is of two young lads turning up on the doorstep in Cambridge spinning a 'wanna buy a ROM mister?' line. Their trip was obviously well worthwhile and anybody who does his or her fair share of Basic or Assembly language programming should read on.

The idea of the *Basic Editor* is that it effectively turns your BBC micro into a Basic program wordprocessor, offering all the facilities of a wordprocessor. The most obvious of these are the ability to scroll in any direction through a program – inserting extra commands

```
The BASIC Editor

Program size  : 2672
Bytes free    : 14992
Screen mode   : 6

>INFO

Scroll on
Overtype mode
White on blue

Program name: XCHECK
Last search : None

Tab value   : 5     No.of lines : 219
First line  : 10    Last line   : 3022
Current line: 320   Marked line : None

Pending commands: None

>_
```

Complete program details with INFO

at the position of the cursor – and the very useful search and replace utilities. There are of course many other goodies in the package, as we shall see.

Like many of Acornsoft's ROMs these days, the Basic Editor is a dual screen affair. Typing *BE places you in the Editor in a mode 7 command screen. The length of your program and the amount of memory remaining is displayed. From here you can enter any of the 29 editing commands.

Pressing the Escape key toggles you into the edit mode screen which, as it implies, is where you write and edit your program. Programs can be loaded and saved in the normal manner, but the program itself is displayed slightly differently. Line numbers descend down the left-hand side of the screen, and the Basic text that follows them is justified a space to the right of each line number giving a very clear uncluttered display.

By default the edit mode screen is mode 7 but this can be changed simply by Escaping to command mode and selecting the desired screen mode. Once in a non-teletext mode you can also define foreground and background colours. White characters on a blue background are selected by default, which I find by far the best display.

When in edit mode the function keys can be used to execute a variety of functions, used by themselves or with Shift and Control like *View*. Just about every feature I can think of has been included here. For example, CTRL-f3 will add the line below to the one the cursor is sitting on. Conversely CTRL-f2 will split the statement(s) after the cursor onto a new line below.

Using the Shift and Control keys in conjunction with the cursor keys allows you to move through your program rapidly in any direction. You can also mark a particular line (CTRL-f0) and jump to it instantly by pressing CTRL-f1.

New lines can be inserted anywhere into a current program simply by pressing the Return key at the appropriate point. The new line will be inserted below. The line number is normally one greater than the one above, except where this would be identical with the one below, in which case the whole program is renumbered. This is quite acceptable but I found it a bit of a pain when editing Basic programs for inclusion in *Acorn User*, mainly because most authors refer to line numbers in their articles!

When you have to use GOTOs in a program (GOSUBs are never necessary) then labels can be used to determine the destination of the command. For example:

GOTO @ end

The destination line should contain the same label after a REM, ie:

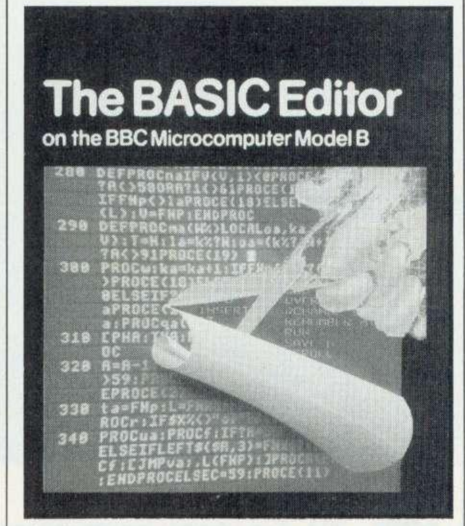
REM @ end

The command NUMBER will convert labels to their specific line numbers.

When in command mode all commands can be shortened to two letters or even one, with no full stop. Commands such as LOAD and SAVE do not require quotes around filenames. A full detailed help sheet on the command mode commands is available at the touch of the 'H' key. Figure 1 shows the dumped screen. INFO provides the low-down regarding the facts on the edit mode status and the program currently under scrutiny.

If you use a procedure library (and we all do – don't we?) the programs can be tacked onto the end of one another with the APPEND command. If any line numbers are duplicated then the two programs are intelligently renumbered to form one consecutively numbered program.

There are four commands associated with searching for strings. All will search for text in the form of variables and print display material and Basic commands, thus they are capable of reading and comparing Basic command tokens. The first of the quartet is FIND, which will display all



the lines containing the string specified after it, ie:

FIND "GCOL0,1"

EDIT is somewhat similar but allows you to edit the line where the string is found. Pressing f5 moves you on to the next occurrence of the string.

CHANGE is a global search and replace command. Thus:

CHANGE "sillynamevariable", "finish"

will change all occurrences of "sillynamevariable" to "finish".

QCHANGE is the selective counterpart of CHANGE. In this case when the search string is prompted you are asked if you wish to change it or not. Pressing 'Y' does the business for you; pressing 'N' will leave the search string intact. In both cases the next occurrence is sought.

All in all the range of facilities that the Basic Editor provides are wide and most comprehensive. The only major omission that springs to mind is a partial renumbering command. While not being an absolute must, and when you write programs the line numbers should not really be of any importance, the inclusion of such a command would, in many instances, have made lots of the Basic toolkit-type ROMs obsolete.

The only other observation I would make is that for a 16k ROM it does seem a little light in content. However, having said that, at £29.90 inclusive of VAT this is undoubtedly one of those ROMs that you should have. Very useful.

Bruce Smith

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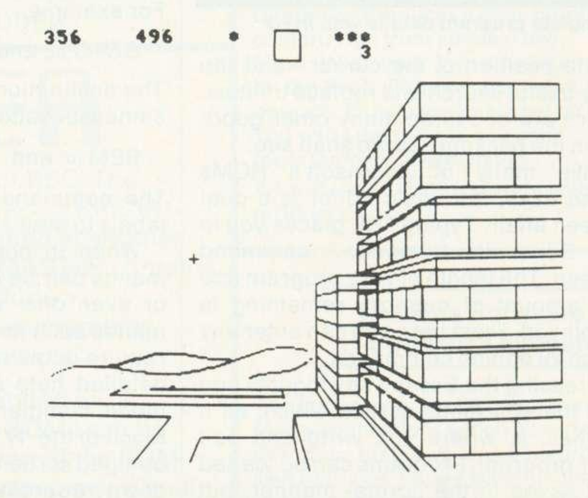
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UDM Rom Ram expansion board	**£55.00 (b)**
UDM 3.1 upgrade (return old DFS rom to us)	**£5.75 (a)**

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REVIEW ROUNDUP

YOU know we've reviewed it but can't remember which issue? Bruce Smith's list of the hardware we've reviewed from July '84 to July '85, plus suppliers' addresses, should help. Coming soon . . . a firmware review guide.

ADDRESSES

AC Aries Computer, Science Park, Milton Road, Cambridge
Acorn Acorn Computers, Fulbourn Road, Cherry Hinton, Cambridge CB2 5LQ
AE Anderson Electronics, 2 Hollin Park Road, Calverley, Pudsey, W Yorks LS28 5PU
ALE Altair Electronics, 1 Cherry Walk, Hayes, Bromley, Kent BR2 7LT
AMS Advanced Memory Systems, Woodside Technology Centre, Green Lane, Appleton, Warrington
CA Cybernetic Applications, West Portway Industrial Estate, Andover, Hants
CM Cheetah Marketing, 24 Ray Street, London EC1
CMS Cambridge Computer Systems, 44a Hobson Street, Cambridge CB1 1NL
COM Commotion, 241 Green Street, Enfield EN3 7SJ
CR Colne Robotics, Beaufort Road, Richmond Road, Twickenham TW1 2PQ
CU Control Universal, Andersons Court, Newnham Road, Cambridge CB3 9EZ
CYR Cyber Robotics, 61 Ditton Walk, Cambridge CB5 8QD
DM Datapen Microtechnology, Kingsclere Road, Overton, Hants RG25 3JB
DCP DCP Microdevelopments, 2 Station Close, Lingwood, Norwich NR13 4AX
Econ Economatics, 4 Orgreve Crescent, Dore House Industrial Estate, Handsworth, Sheffield S13 9NQ
ES Educational Software, 108 Parthenon Drive, Liverpool L11
FB First Byte Computers, 10 Castlefields, Main Centre, Derby DE1 2PE
GCC GCC (Cambridge), 66 High Street, Sawston, Cambridge CB2 4BS
GEM Gemini Marketing, Concord Road, Dinan Way Industrial Estate, Exmouth, Devon
GSL Geophysical Systems, Westport Way, Andover, Hants
IGR InterGalactic Robots, Unit 208, Highbury Workshops, 22 Highbury Grove, London N5
JM Jessop Microelectronics, Unit 5, 7 Long Street, London E2 8HN
LE Lecmar Electronics, Vectis Yard, Cowes, IoW
Loco Loco Systems, 5 Stainton Walk, Goldsworth Park, Woking, Surrey GU23 1JB
MDW Midwich Computer, Silray Road, Diss, Norfolk
MH Mushroom Computers, Aston Road, Cambridge Road, Bedford MK42 0LJ
MW Microwriter, 2 Wardle Way, Willow Lane, Mitcham, Surrey
NC Northern Computers, Churchfield Road, Frodsham, Cheshire WA6 6RD
NMC National Micro Centres, 36 St Peters Gate, Stockport
PE Parfitt Electronics, 6 View Road, London N6
PR Protek Computing, 1A Young Square, Brucefield Industrial Park, Livingston, West Lothian EH54 9BX
PS Pace, 92 New Cross Street, Bradford BD5 8BS
RCD Robot Computer Development, National Industrial Estate, Bontoft Avenue, Hull
RCT Robot City Technology, 20 Burners Lane, Kiln Farm, Milton Keynes MK11 3AU
RD Rushworth Dales, 20 Orange Street, London WC2
REM Remcon Electronics, PO Box 81, Chislehurst, Kent
RH RH Electronics, Chesterton Mill, Frenchs Road, Cambridge CB4 3NP
SC Smith Corona, widely available from dealers
SCS Stack Computer Services, 290-298 Derby Road, Bootle, Merseyside L20 8LN
SK Seikosha, widely available from dealers
Sony Sony House, South Street, Staines, Middlesex
SS Scarab Systems, 39 Stafford Street, Gillingham, Kent
TC Torch Computers, Abberley House, Great Shelford, Cambridge CB2 5LQ
TCOM Telefusion Communications, Unit 9, Barrs Fold Close, Wingates Industrial Estate, Westhoughton, Bolton
TE Thanet Electronics, 143 Reculver Road, Herne Bay, Kent
Toad Toad Educational Computing, 8 Westboune Grove, Sale, Cheshire
TP Tarren Products, Factory D1, Treforest Industrial Estate, Pontypridd, Mid-Glamorgan
TWS Twillstar Computers, 17 Regina Road, Southall, Middlesex
VD Valiant Designs, Park House, 140 Battersea Park Road, London SW11 4NB
VIG Viglen Computer Supplies, Unit 4, Trumpers Way, Hanwell, London W7 2QA
WE Watford Electronics, 250 High Street, Watford, Herts

	Maker	Cost	Issue	Page
ABC micros	Acorn	—	Nov 84	30
Acorn Z80 *	Acorn	£399	Apr 85	141
Alfred	RCT	£314	Jun 85	81
AMX Mouse	AMS	£89.95	Apr 85	164
AOR A2001*	LE	—	Sep 84	29
Apex *	ALE	£57	Apr 85	167
Aries B12 *	AC	£46	Apr 85	167
Armdroid 1	CR	£625.25	Jun 85	81
BBC B + micro	Acorn	£499	Jul 85	160
BBC Buggy	Econ	£189	Jun 85	77
BBC Buggy *	Econ	£189	Nov 84	164
Beasty	COM	various	Jun 85	79
Colour Light Pen *	RH	£45.95	Dec 84	201
Cube Beebflex *	CU	£359	Mar 85	179
Cyber 310	CYR	£748	Jun 85	81
Datagem *	GEM	—	Dec 84	151
Datapen *	DM	£25	Dec 84	201
Demon modem	RD	£60	Apr 85	159
Digigraph Mk II *	TP	£104.55	Nov 84	187
Disc drives	various	various	Jul 85	133
Electron Joystick Interface *	PS	£24.95	Feb 85	47
Electron Plus 1	Acorn	£59	Jul 84	18
Electron ROM card *	MH	£29.95	Feb 85	47
Electron Switched Joystick Interface *	FB	£19.95	Feb 85	47
Exprom *	AE	£59.95	Apr 85	167
Fischertechnik	Econ	£64.95	Jun 85	75
Hard disc	GSL	—	May 85	169
Icom IC R70 *	TE	£550	Sep 84	27
Interbeeb	DCP	£69.95	Aug 84	157
Jessop Turtle *	JM	£182	Nov 84	164
Memocon Crawler *	COM	£35	Nov 84	164
Mentor	CA	£709.50	Jun 85	81
Micro Pulse Buggy *	NC	£132	Nov 84	164
Midi Hardware	various	various	Jul 85	81
Midwich *	MDW	£27	Apr 85	167
Movits	COM	various	Jun 85	73
Music 500	Acorn	£199	Jun 85	172
Nightingale *	PS	£136.95	Feb 85	167
Parfitt Plotter	PE	£270	Sep 84	149
Philips TP200 Monitor	TCOM	£83.80	Nov 84	191
Prestel Adaptor *	Acorn	£113.85	Feb 85	167
Protek 1200 *	PR	£59.95	Feb 85	167
Quinkey	MW	£49.95	Sep 84	143
Ramamp *	TWS	£56	Apr 85	167
Ramrom 15 *	GCC	£129	Apr 85	167
Robin Light Pen *	ES	£41.40	Dec 84	201
Robot Plotter *	RCD	£59.95	Nov 84	187
ROM Cartridge *	VIG	£19.95	Oct 84	185
ROM Cartridge *	NMC	£19.95	Oct 84	187
ROM extension socket	Toad	£19.95	Nov 84	82
Romex 13	GCC	£45.95	Nov 84	191
RTTY MPTU-1 *	SS	£70	Sep 84	29
Sage Pack (Z80)	GCC	£425.25	Mar 85	133
Seikosha GP700A	SK	£395	Feb 85	177
SMC-100 *	Loco	£149.95	Feb 85	167
Smith-Corona Fastext 80 printer	SC	£224	Feb 85	177
Snap EV1	COM	£129.95	Mar 85	164
Sony ICF 7600D *	Sony	£160	Sep 84	27
Speech Synthesiser	WE	£44	Nov 84	83
Stack Light Pen*	SCS	£28	Dec 84	201
Sweet Talker	CM	£24.95	May 85	175
Teach Robot	REM	£515.20	Jun 85	81
Unicorn	TC	£3337	Sep 84	139
Uniden 2021*	LE	£200	Sep 84	27
Valiant Turtle*	VD	£228	Nov 84	164
Zeaker*	IGR	£100	Nov 84	164
Zep 100*	TC	£343.85	Apr 85	141
Zep 240*	TC	£803	Apr 85	141
Zero 2	IGR	£99.95	Jun 85	81
6809 SP*	CMS	£249	Mar 85	179

**Part of a comparative review*



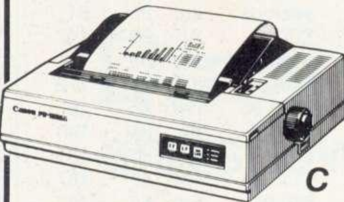
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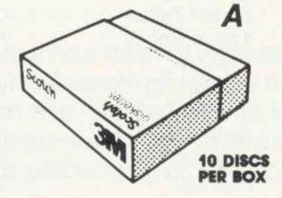
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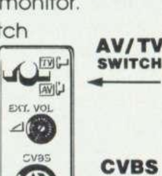
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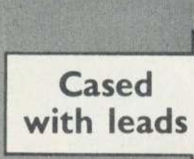
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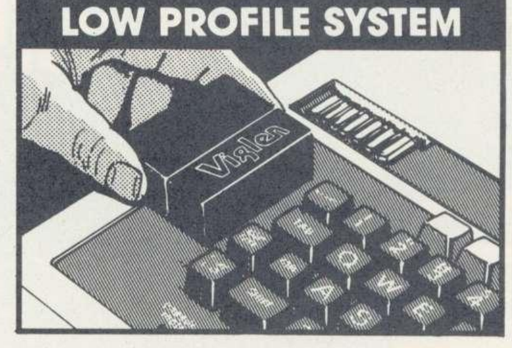
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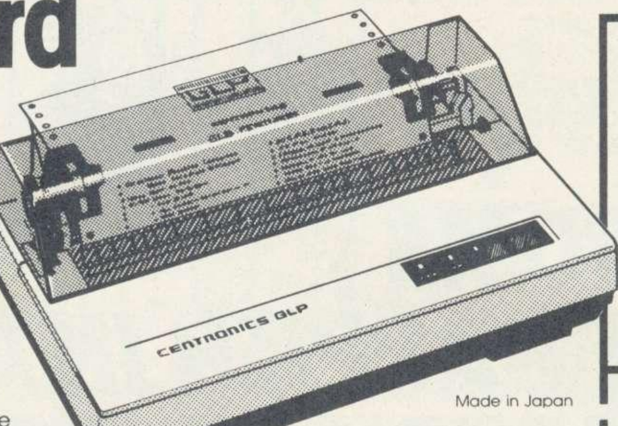
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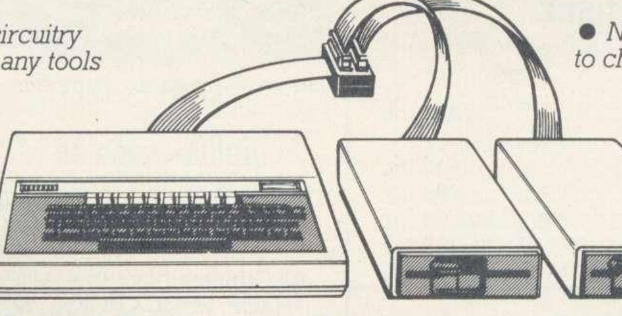
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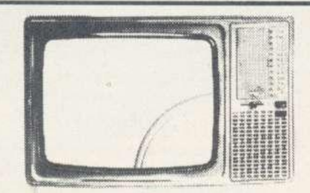
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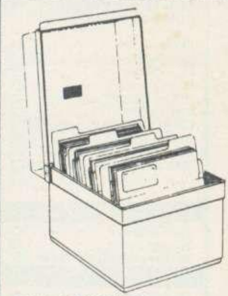
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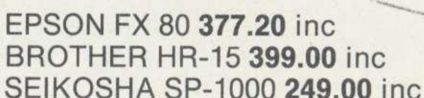
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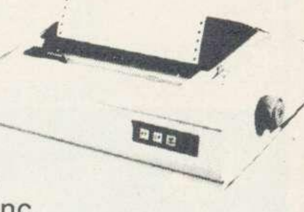
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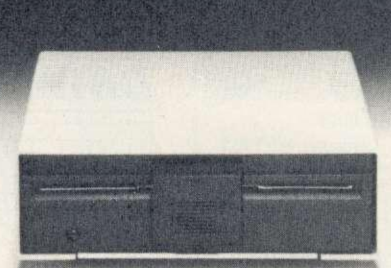
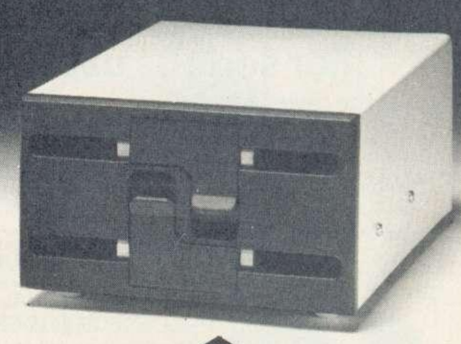








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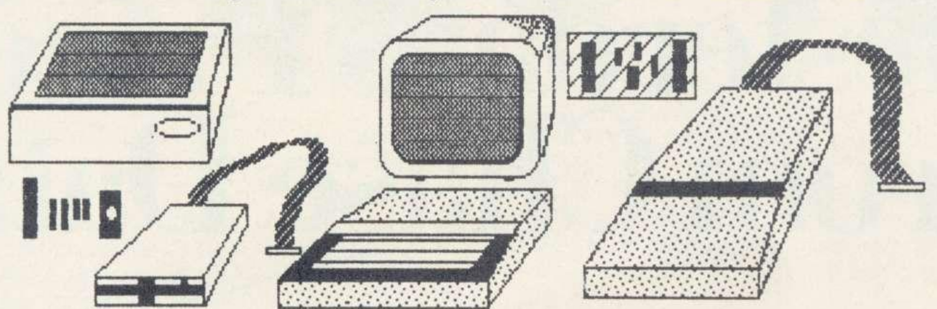
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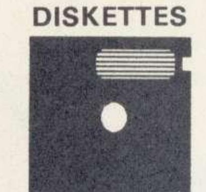
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ACORN Electron, 10 month guarantee, Quickshot II joystick + interface + cassette recorder, dustcover and all leads, 10 games, magazines and 1 yr subscription to Electron magazine. All £200. Tel: Steve on 021-523 0452.

COMMODORE 64k, new, and C2N cassette. Seven books, manuals. Cost nearly £400 – sell for £175 ono. Buyer collects. 34 Glasfryn, Henllan, Denbigh, Clwyd. Phone Denbigh 4083. Frank Hughes.

BBC B and Epson FX80 with tractor attachment, printer stand, cassette recorder, APTL sidewise fitted with wordprocessors, spreadsheet, printer and utilities ROMs. Some books. Total value £1,250 – bargain price only £750. Telephone 0305 62723.

DISC-BASED Atom system. 29k RAM, Wordpack, Atomcalc, Toolbox. Ideal for business or scientific use. Includes printer cable, books, wide range of software. Offers around £200. Bedford 750957.

WANTED: joystick to plug into analogue port of Acorn plus 1. Would prefer Sureshort but any considered: The cheaper the better! Telephone (0252) 541646 and ask for Andrew after 5pm or weekends.

WANTED sideways ROM board for Electron. Up to £20 paid. Ring 0524 791317.

PAIR of 40 track single sided disc drives (Teac) with leads, £100. Tel: 01-953 3351 evenings or Prestel mailbox: 01953351.

BARGAIN! 40 track Micropulse disc and formatter plus Opus double density interface. Going for a song, genuine reason for sale. Only £80. Contact J R Noble, 13 Garden Terrace, Painthorpe, Wakefield WF4 3HJ. Telephone 255401.

SELLING: NEC8023 printer, View printer driver and screen dump, £280 ono. Also Viglen (Teac) dual disc drives, ss 40/80 switchable, own PSU, one year old, £350 ono. Tel: 0223 323428 evenings: Sheldon.

ELECTRON manuals, leads and software, two months old, hardly used, boxed, £115. Telephone Swansea 72985 after 6 pm and ask for Gavin. Or swap for BBC 5.25 100k disc drive.

ATOM 12 × 12k FP £35. Sound board, colour board, Tool-box, Wordpack, Database, Graphics Eprom's £15. 4-way mother board £12.50, all with manuals. Software, books £3 each. Tel: (0202) 761095.

32K BBC Brother-HR5 printer, Wordwise, Graphics Extension ROM, cassette recorder, loads of software (including Elite), books (including AUG), magazines (including every Acorn User). May split. £350. Phone: Richard 01-733 6229

LVL double density discs interface for BBC, only £80. Tel: 01-679 4469.

WANTED a Microvitec colour monitor in good condition, medium resolution, capable of wordprocessing in mode 0. All prices considered. Tel: 585013 (Nottingham) after 6pm.

MATTELL Intellivison. 4 games plus voice synthesiser, £50 the lot. Or will swop for any BBC B modems. Phone (0702) 72931 during holidays or write to Intellivison, Edmonstone, Haileybury, Hertford SG13 7NU.

VECTOR I, as new, £8. Tel: 051-426 5742.

IKON Ultradrive plus one utilities cassette and one blank cassette. Brilliant condition. Want £50 ono. Phone Danbury 4231 and ask for Richard.

ACORN ELECTRON boxed, guaranteed, with cassette recorder, joystick interface and £140 worth of software with top games and Learn Basic package. Also books and mags. Everything £250 ono. Tel: Birmingham (021) 523 0452.

DISC DRIVE Canon dual 40 track in 'office case' with power supply. Software, new box of discs, cable for BBC micro, £220. Tel: 01-941 0505.

TORCH Z80 2nd processor, CP/M compatible, with Perfect Software including all manuals, discs, chip, etc, and external Z80 board: plugs into Tube socket, £185. Lewis, Bromley, Kent. Tel: 01-467 6461 evenings.

ANY EXPERIENCED BBC/Electron users wanting to swap programs and ideas. N Berry, Field House, Burnley Road, Mytholmroyd, Halifax HX7 5PD.

DISC DRIVE, 400k 80 track double sided, Shugart with utilities software disc. As new £150. Tel: Nottingham 503312.

VOXBOX voice digitiser and recognition system for sale. Normally £95, now £50. Phone Bradford 44409. 4 Duchy Crescent, Heaton, Bradford.

DISC DRIVE for sale. Shugart SA400 35 track SS SD, cased with own PSU. Full working order, complete with cable for BBC and several discs. £55 + post. Tel: (02216) 2936 (Wiltshire) Evenings.

BASICODE: Want to communicate in and about Basicode? Contact Bernard Emblem, 1 Birchen Bower Walk, Tottington, Bury BL8 3JY.

WANTED. A discontinued program called Apocalypse by Red-Shift. Telephone: David Clouter on 01-555 3111 ext 2841 daytime or Romford (0708) 753258 evenings or weekends. Original complete with instructions for BBC B micro please.

ACORN AP100A graphic printer, still boxed. Two text modes plus graphic mode. As new, includes leads and manual. Any reasonable offers. Phone Ian, St Albans (0727) 38563.

ATARI 2600 for sale with: Quickfire adaptor, joysticks, paddles, Starwars, Defender, Missile Command plus others. Only £99. Write to Stuart, 24 Chestnut Close, Chesterton, nr Bicester, Oxon. Please enclose phone number.

DISC DRIVE, 200k, as new in original packing, £125 ono. Tel: (0621) 817293 after 6pm.

WANTED Epson RX80 or MX80 printer. Also 40/80 switchable disc drive with PSU. Tel: 061-720 8582.

PRINTER – Tandy LPVII dot matrix, 80 column, tractor feed, parallel and serial, £100. Tel: 01-263 6760.

TEAC 40 track double density disc drive. Perfect condition, only £100: new costs £200. Also available: single density disc interface which includes the much wanted 8271 FDC, only £65. Tel: weekends and evenings (0622) 58798.

FREE Apple dot matrix printer and manual when you buy my Beeb printer connecting lead for £200 ono. Simon 01-387 5175.

WANTED BBC B. Would also consider package: printer, monitor, disc crive, software and games. Phone: 01-505 0253 after 7 pm or Saturday, or write to 30A St Barnabas Road, Woodford Green, Essex.

BBC B. DFS plus 40/80 trk twin 800k Teac drive 5, 6502 2nd processor, Microvitec monitor, power supply cassette, RH L/PEN, ATPL board, 16k switched CMOS RAM, speech processor, joysticks, ROMs, 30 discs, software, books, etc. £1200 bargain. No offers please. Tel: Flitwick 715279.

WANTED 32k sideways RAM in exchange for RH lightpen and either Caretaker or Graphics ROM. Tel: 041-946 9110.

ANYONE written or bought a good or even half-decent American football game/simulation for the BBC? Mike George, Tel: 061-707 2417 or 9 Rockhouse Close, Barton, Eccles, Manchester M30 7AJ.

DISC DRIVE – 200k double sided 40 track, cables, utility disc and manual. £100. Tel: 021-444 4954.

FOR SALE Ferguson computer cassette player £13, Prism 1000 modem £30. Tel: 01-736 7714 after 8 pm and ask for Satvinder.

TEAC double density 40 track disc drive. VGC, only £100: new costs £200. Also available: single density disc interface, includes the much wanted 8271 FDC, for only £65. Telephone evenings and weekends (0622) 58798.

PL GRAPHICS digitiser system: digitiser, software and manual £30. Tel: Rob, Rochdale (0706) 40486.

COMMODORE 64 C2N cassette, joystick, software, reference guide. Will exchange for Electron and Plus 1 interface and cassette unit. Please contact David Cross, 33 Sykes Street, Newhey, Rochdale, Lancs OL16 4JP. Tel: (0706) 841581.

SEIKOSHA GP80 printer, ideal for listings, etc £50. Acorn Atom 12 + 12 with Wordpack, £80 ono. Tel: (07842) 44396.

ELECTRON ROMbox for sale. Made by Slogger Advanced Systems. Holds 8 ROMs and plugs into the back of the Electron. Hardly used. £30 ono. Tel: 01-854 7350, anytime.

FREE PERSONAL AD SERVICE

Sell your old hardware or pass on information. Fill in the form below to a maximum of 32 words (one in each box) and send it to Acorn User Free Ads, 68 Long Acre, London WC2E 9JH. Use capital letters, and remember your name, address or telephone number. Without this full information, supplied on a separate sheet of paper, we regret that we cannot carry your Free Ad. This is a service to readers – no companies please. One entry per form only, and we cannot guarantee any issue.

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■ **BBC B** with Acorn DFS, disc drive, tape recorder, mono television, ROMs on board, many programs. £600. C Weatherburn, Chinnor, Oxfordshire. Tel: (0844) 51004.

■ **BBC B (D)** plus Watford Electronics disc drive, boxed as new, £395 ono. Electro-Music Research software £110 ono. Neil Gibbons, 01-580 5566 days.

■ **Conundrum Castle** – a must for every compulsive adventurer. For BBC B cassette: £5.95/disc: £7.95. Cheque/PO to A Moulden, MOULDYsoft, 10 Apollo Walk, Portrush, Co Antrim, BT56 8HQ.

■ **BBC B** for sale. Year old. 100k drive. Wordwise ROM, joystick, manuals, software. Cost £700, will accept £550 ono. Also 14" colour TV £130 ono. Tony, 01-337 8893.

■ **I/O Port Tutor** for the BBC B user ports. Initialisation, input and output of data, all explained using a high-quality traffic lights model with interactive program. £29 incl. ADH Systems Ltd, Unit 1A, Arundel Mews, Arundel Place, Brighton, Sussex.

■ **Nightingale** modem plus Commstar £100. Grafpad £60. Micropulse ROM box £30. View 2.1 £35. Lisp £30. Debug £25. System ASM £20. Tel: (0983) 406703.

■ **External** mini ROM-boxes. Safer, cheaper, easier to fit/use than ashtrays, cartridges, boards. ZIF socketed fast ROM changes £15.50 inc. Driver, 7 Wimblestone Road, Winscombe, Avon BS25 1JR.

■ **EPROMs 27128** stock clearance, genuine, unused, first class. 250ns parts £3.50 each inclusive. Security Soft Ltd, Unit 19, Derby Trading Estate, Stores Road, Derby DE2 4BE.

■ **EPROM** programming service. Backup ROM/RAM or your own program on EPROM. Send ROM/disc/tape with £7 (8k) or £9.50 (16k). Erasing £1. Send SAE for details. R C H Cheung, 48 Sunnymead Road, London NW9 8BU.

■ **BBC** Acorn Z80 with Pro-Pascal, ProFortran, Cardbox+, Perfect Writer + BBC software. Includes monitor, printer, Solidisk 32k RAM and system case. Phone Watford 46284 after 6pm. Only £980 ono.

■ **Economics** educational programs, recommended and used by schools and colleges. Suitable for A level, BEC, etc. Details from Beecon Educational Software, 16 Kingrove Avenue, Beeston, Nottingham NG9 4DQ.

■ **BBC model B** 1.2OS, disc drive plus DFS, computer desk, Cub monitor, RH lightpen, joysticks with ROM, dust cover, discs, original games. Offers. Tel: (0427) 610791, evenings.

■ **Charity Covenants** Store, edit, print tax claim on BBC micro. £10 cassette; £12 disc; SAE for details. Jetsoft, 1 Oldcroft Close, Kingston Blount, Oxford.

■ **People's Software**, 10 Lawrence Road, London SE25 5AA. Three packages for BBC micro with disc drive: Database, Wordprocessor, Spreadsheet, £5 each. Before ordering send SAE for details.

■ **Vannin Software.** Exciting games and educational software for the BBC B. Laser Attack, Spider Speller, The Golden Maze, Double Turn. For details please write to Vannin Software, 133 Boroughbridge Road, York YO2 6AA.

■ **Mailing list** £14.95 or tailor-made for £19.95. Features: personal letters and unlimited records. Write for full details to CPU Software, 42 York Road, Rayleigh, Essex SS6 8SB.

■ **BBC Graphics Planning Sheets.** A4 pads (80 sheets), £1.99 each +50p p&p to YES, 2 Fleckney Road, Kilby, Leicester LE8 1TB.

■ **Binders.** Stiff plastic titled ring binders for all Beeb manuals. SAE for price list please. Eg, User Guide binder £4.50 inc p&p. Hepworth & Co, Waulkmill Farm, Ingersley Vale, Bollington, Cheshire SK10 5BP.

■ **'How-To'** move your S/W from tape to disc. An essential collection of S/W and information for frustrated disc owners: £5. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. (0234) 781730.

■ **Centronics 739** printer ROM. Dumps colours shaded, *command printer mode selection, Wordwise fkeyset, manual, utilities (state tape or disc), £25. Electrocomp, 5 Poldep Close, Cove, Farnborough GU14 9HN.

■ **BBC B discs.** Aesop's Fables £4. French: Time £4. English: Micromouse/Matchbox £6. Physics: Mirrors/Lenses £5. Subject Software, 31 Beech Close, Broadstone, Dorset BH18 9NJ.

■ **'Nutcrackers':** Tape-2-tape + Tape-2-disc + Disc-2-tape + Disc-2-disc + Tapemaster: £5. Rompull: £5. ROM-filing system generator: £5. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. (0234) 781730.

■ **Animouse:** Animate AMX Art screens. 40 track disc, Util. + manual. Paintpot/Colour Art compatible. Author, editor, viewfax, Mouselink. £9.95 all in to: P. Lee, 2 Waddington Terrace, Mexborough, South Yorks S64 9BA.

We must remind advertisers that we cannot carry advertisements which incite readers to break the protection and therefore copyright of commercial software.

■ **White Knight Mk** 12 Chess game on disc, £9. Jones, 25 Morfa Road, Penrhyn Bay, Llandudno, Gwynedd LL30 3PT.

■ **Electron ROM** expansion unit. The 'EPROM Plus' uses the Plus 1 ROM slots to allow 4 8k/16k ROMs to be individually selected. Many Beeb ROMs are compatible. Price £15.95 inc for 1, £27.95 for 2. Expandor Systems, 99 Staley Hall Road, Staley Bridge, Cheshire SK15 3DP. Cheques payable to P Giblin.

■ **Hackers** Phone Book. Telephone numbers and guide to bulletin boards, mainframes, listed and unlisted worldwide, £6.75. B L Sothcott, 56 Waterloo Road, Freemantle, Southampton.

■ **Twin** will back-up valuable protected discs – success guaranteed; £8. Digger displays format information and contents of all readable tracks. You can alter the disc or save the data on a normal format disc; £7. Dual creates a 40/80-track disc; £4. All on one disc; £10. Dispatch by return. J E Connett, Dene Croft, Westcott Street, Westcott, Dorking, Surrey RH4 3NY.

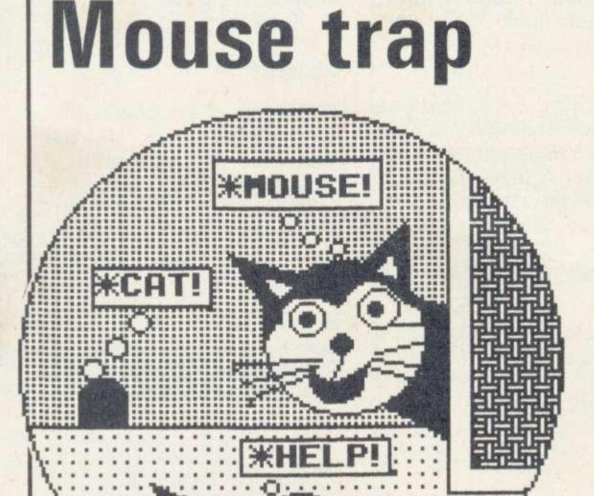
■ **'D-Master':** The most powerful disc backup program seen so far: £7. Nutcracker owners: £3. Handles sectors from 128-2048 bytes, deleted or not, etc. R-Soft, 22 Marriotts Close, Felmersham, Beds MK43 7HD. (0234) 781730.

SMALL AD SERVICE

Please include your cheque for £11.50 (inc. VAT) made payable to Redwood Publishing. This is the standard fee. Don't forget your name, address or phone number. Send cheque plus form to Acorn User Small Ads, 68 Long Acre, London WC2E 9JH.

ACORN ABUSER'S Diary

Mouse trap



NEW PENCE
Out of Stock

Acorn regret that this item is currently out of stock

HERE'S the winner of the August Diary competition for the best badge design handed in at the Acorn User exhibition (above) – a set of AMS Desk and Utilities discs is on its way to Andrew Wood of Buckingham. Honorary runner-up (left) was Jonathan Inglis.

You can't see the Acorn for the trees

COMMODORE had news of the 128k RAM machine plastered all over the PCW Show. You couldn't see the walls, stairs or balcony for Commodore 128 posters.

You couldn't see half of the main floor for Atari ST machines, and although there was nothing to see on the Sinclair stand, you couldn't help but see the stand.

You couldn't see the desks on the Amstrad stand for PCW8256 systems – moving in to take over the home and small business wordprocessing market the BBC created in the first place.

Meanwhile, Acorn hid the launch of the BBC 128 on a corner of the stand. Reporters had to ask where it was! A tacky sticker on the top of the micro was the only clue that this was it!

No wonder Acorn's new MD Brian Long spent more time on the Amstrad stand than on his own. He probably learned more about marketing from one afternoon there than Acorn has done in three years.

Amstrad's built-in death span

ALSO at the PCW show was the new machine from Amstrad. It seems to have come a long way since the H1F1 days, its latest machine having built-in printer, built-in green and green monitor, built-in 2.5in disc drive ('what do you mean – they're not standard?'), built-in keyboard (with keys), built-in wordprocessor, built-in lots of RAM, built-in Amstrad quality assurance, with the usual Amstrad six-month obsolescence guarantee.

Showtime fanfare

ANYONE notice the fanfare given the BBC B+ 128k at the PCW show? No, well we didn't either. Selected reactions were as follows:

'Is it compatible with the *Wordwise* latch conventions?' – Chas Mire

'What are the implications on opening hours?' – Alex van Earring

'It's not enough' – Max Highwatermark

'What's that?' – T Quinn

'But it still hasn't got a 32-bit processor and MicroClives' – Uncle Who

'I'm afraid it won't run *View*, and no, we haven't got any software for it' – R McMilan, Acornsoft

'You'll be surprised at the people who will want to use it' – John Cashwell, Acorn

The most boring show on earth

IT'S BACK, the most user-boring show of all – organised by Micro Mousse and Elk Loser. On public display for the first time, here's your chance to throw Electrons at Barry Wood whose fossilised brain was recently transplanted and used as an I/O processor for a cassette motor.

SAVE MONEY! . . . with our special rail travel offer. Don't come.

Down the tube

HAS anyone noticed how the standard of documentation is going down the tube? The number of times 'softwear' gets through is amazing. And now Acorn has invented organic and inorganic physics on its leaflet for the ADFS!

But the crowning folly comes from no less than the British Computer Society in a sample issue of its paper for the new AYCE group for youngsters.

This contains no less than eight entry forms which all ask: 'Which mirocomputer do you see most frequently?' Must all be written by Mirenet hacks off-duty.

Special vintage

RUMOUR has it in Fenland that after the BBC B++ will come the BBC A–, a special vintage edition with 256 bytes of RAM, operating system entered directly from the keyboard with a planned upgrade to cassette 'just around the corner'.

Poking problem

SO THE Basic Editor ROM doesn't poke the screen, huh? Bet you can't edit your 64k B++ programs in it.

One lump or two?

THERE'S a coffee machine in Cambridge with options for a T, a T+ and a T++. If you press T++ you get it wet, white, sweet and in a cup the right way up. Usually.

Eight-eyed quiz

THERE are four magazines for the BBC micro under the charges of Mark Webb, Mike Williams, Peter Brammell and Tony Quinn. Of the four only Tony Quinn isn't cross-eyed, boss-eyed or a squinter. Does this make him a freak?



'See what so many micro shows does for business?'

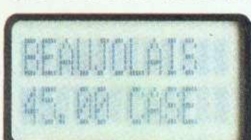
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WRIST TERMINAL RC-1000
TIME LOCK ALARM
SELECT TERMINAL SET
TRANSMIT

Have you ever forgotten an appointment, the price of a product, or even your own anniversary? Not any more. The new Seiko RC-1000 Wrist Terminal will change all that, permanently.

LOS ANGELES
AM 11:20 50

Only Seiko's advanced micro electronics technology could have produced the RC-1000. It is in fact, a computer terminal:



miniaturised then fitted into a small stylish module to be worn on your wrist like a watch, ready to recall important data from your personal computer* any time, anywhere.

The RC-1000 has a 24 character screen and an extensive memory that holds up to 80 screen 'pages' of information that can be sub-divided into 12 separate data files. A detachable lead allows it



to interface to the RS232 port of your computer and a sophisticated menu-driven database allows you swift access to your files.

Now imagine what the RC-1000 could do for you. As an 'electronic notebook', you can keep addresses, prices, statistics, in fact any type of file, ready to recall at the touch of a button. The

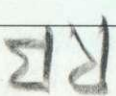
07:15 SQUASH
VS:SARAH

memory also keeps track of world time zones — vital for international business; you can display schedule reminders that can be used with the alarm function up to a year in advance (good for birthdays); or set to repeat at the same time every week. The list of uses is as endless as your busy timetable. The computer has revolutionised working lives. Now let the RC-1000 revolutionise your life.



20:10 RECORD
DALLAS

SEIKO
RC1000 WRIST TERMINAL



The Seiko RC-1000. £99.95. At all good computer specialists, now.

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